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EDUCATION AND INDUSTRY.

FROM the *Times* of February 22nd we learn that the Board of Trade has authorised an Exhibition to be held in London with a view to "a more scientific co-operation between education and the industrial arts in this country." This has been done at the instance of a body of men, among whom are Lord Aberconway, Mr. Frank Brangwyn, the artist, Mr. F. V. Burridge, of the Central School of Arts and Crafts, Mr. H. G. Wells, Mr. Gordon Selfridge and Mr. Ambrose Heal. The Exhibition is intended, we gather, to show, as an object lesson to ourselves, how German manufacturers have used the Art Schools of their country to train designers for their particular needs, and have taken steps at the same time to educate public taste and discrimination. In recent years we have seen in this country such a process carried out with great energy, and conspicuous success, by the great furnishing firms. Specimen rooms, and in some cases suites of rooms representing whole houses, have been shown by leading firms, and everyone went to the Ideal Home Exhibition. No one could help seeing there what great judgment and care were required for much of the exhibit, and the general taste and appreciation of the purchasing public has much improved in every direction in late years. We believe this country is now recognised as leading the world in the furnishing trade, and this must be attributed to the action of the manufacturing firms in developing artistic design parallel with skilled workmanship and efficient manufacturing.

The process can be carried out to a greater or less degree in a great number of trades, and the proposed Exhibition will show that German thoroughness has introduced it into trade manufacturing to an extent which few of us would suspect. We look forward to the Exhibition with great interest, and hope that the results may fully answer the expectations of the promoters.

This proposal deals, however, with but one section of a greater question. How are we to rearrange the educational system of the country so that school training shall be part of an ordered and intelligible process, by which a child grows into an efficient and capable worker? The question has been discussed more than once in these columns, and is the crucial problem of national education.

The main scheme of our educational system is far from being closely in touch with trade and industry. Indeed, these hardly come into the picture at all. There is no difficulty in accounting for it. The history of the civilisation of Europe is a sufficient account. But while we have allowed the matter to run on in the groove in which our ancestors started it, Germany has known how to set a wiser course, and has been reaping the advantage of her wisdom. The result is that in this country the secondary schools implicitly, if not explicitly, present to their pupils as the object of training, mental cultivation of the literary and scientific kind, while the ideals of industrial enterprise are not presented at all. The instruction given at our great public schools and the Universities is really not wide enough for

all modern purposes. If one were to tell a man who had built a successful career on the basis of such education, say one of the Judges, or a young Bishop or headmaster, that the scope of his instruction had been extremely imperfect, he might be surprised; he might even be rude; but the fact is that while English public schools are admirable places for learning manners and conduct, and the *ars vivendi*, their instructional curriculum is very narrow. This may not be a serious matter, having regard to the class from which the boys come; indeed, for their purposes the curriculum is probably wide enough, but it is not wide enough for other schools; and what is serious is that they, unluckily, set a pattern and standard to the schools for the middle and upper working classes which is quite unsuitable and is extremely mischievous.

We expect that this promised exhibition will emphasise once more the necessity in this country for an extended system of secondary schools, organised with a clear purpose of industrial training.

RUSSIA.

Various reports and other communications that have lately reached us from Russian sources bear evidence of the great desire that exists among electrical men in the leading cities of that vast Empire to throw off the German yoke and avail themselves of British electrical manufacturing facilities. The new bond of Russo-British friendship will hold good for many a year, and one of its consequences will be to furnish us with opportunities to assist in the electrical and engineering development of a wonderful field for enterprise; but, at the moment, sheer necessity presses, because German sources, upon which so much dependence has been placed for electrical goods in the past, have been closed for many months. From what we have already read and heard of the efforts that our Russian electrical friends desire to make for removing German influences and control, we are led to hope that they will, as time passes, exhibit in this connection the same determination and resourcefulness which have distinguished the military operations of the Grand Duke Nicholas and his dauntless millions.

We believe, too, that when the Czar's Government comes to deliberate seriously respecting the regulation of matters relating to internal industries and to export and import trade, it will not be found wanting, but will be prepared to render assistance to electrical and engineering works and traders in such ways as shall facilitate the operations of the Allies in competition with present enemies. These enemies have been enabled to prepare to wage this terrible warfare partly by securing profits to the tune of many millions per annum from electrical concessions and trade in the country whose deep-snowed lands have now been dyed in human blood. This Governmental assistance, however, is hardly a matter of immediate possibility—Russia will doubtless develop a new and sweeping international trade policy in due course, and we may reckon that, as far as practicable, that policy will be favourable to ourselves and our Allies, and perhaps some neutrals. When that time comes, probably, the present projects of British electrical manufacturers will have been carried to such a stage that England will be enabled to co-operate from present and extended manufactories. But at the moment, all information is to the effect that, as we have said, sheer necessity for electrical supplies urgently presses. The difficulties that stand in the way of immediate electrical trading operations between us seem to be very great, but the proceedings in the Dardanelles give ground for encouragement, for, when these are successful, providing there is shipping accommodation available—a point which is not likely to have been lost sight of by those responsible for the approach through the Narrows—there will be a free flow of exports and imports again which will inevitably relieve the financial situation and remove or lessen the rate-of-exchange difficulty. British exporters no less than Russian importers are hoping for this relief to come as speedily as possible; until it does come there must, we suppose, be a continuation of the handicap on trading operations, though we trust that our firms will not be too hurried in turning down the business which is actually offering. We are well aware that our manufacturing ability is to a large extent monopolised by Government demands, and that there is a certain amount of shyness or wariness in relation to the Russian market, but it will be fatal to any schemes that we may cherish for later trade developments if we allow Russian buyers to get the impression that it is useless for them to expect to get what they need from British works. We ought to do our utmost to prevent them thinking either that we can't, or don't want to, do business with them. If such ideas be permitted to gain currency, sheer necessity, when the War is over, will drive them, sentiment notwithstanding, to deal with enemies that are geographically near and have laid themselves out to meet Russian electrical requirements.

It is such considerations as these that should seriously be weighed by us in organising our efforts to "capture" German trade in the Russian market. It is for the future to decide what course the Czar's Government will see fit to adopt, and what course financial settlements will dictate, in regard to German electrical concessions and works in Russia. Ownership of concessions, in German hands at any rate, generally means a German monopoly of most of the electrical needs arising in connection with the development of such concessions. We should like to see more British money invested in Russian electrical concessions, and to have some assurances that the investment of such money will bring us actual business as well as dividends. But, whatever may happen in these directions, we think it is obvious to all who have studied the peculiarities of the position, that Russian electrical trade is not going to be won, and held, unless measures are adopted commensurate to the present and prospective value of the trade, and suited to the difficulties of the case. We believe it is generally recognised that in Canada, a British Dominion, the Americans have been able to secure a firm hold upon some departments of electrical trade by influencing in the past the character of Canadian electrical engineering work. Geographical situation and seizure of early opportunities have assisted to produce this state of things, and the result is that, to British firms, Canada has proved to be one of the least easy of all British Colonies to work.

Now, to an Englishman the Russian character and point of view are not likely to be easier to understand than the Canadian; for our small knowledge of the language at once forms a handicap.

It seems to us that we have got to recognise that when we are not at war, the position in Russia is somewhat similar to that in Canada so far as British electrical firms are concerned. There are on the side of Germany all the advantages that ensue from geographical situation, long years of close study of the market and of the Russian people, financial control, and linguistic attainments. The Allied Russians will not *want* to buy from Germany, but our kith and kin in Canada have frequently said that they *wanted* to order from England—in actual fact, however, they more often go South over the border to get what they want if Canadian factories, often of American ownership and control, cannot meet them. What will happen to those German-owned factories in Russia is, as we say, an interesting question for the future, but we put forward this brief comparison between the land of an Ally and a British Colony more with the view to assisting the trade to a proper understanding of the position so that measures conceived, and plans elaborated, shall be of a suitable character.

By the courtesy of a correspondent we are enabled to publish below some extracts from a letter received from an Englishman long resident in Russia and doing business there in electrical and engineering goods. We believe that they will repay study.

I may say plainly that quality and endurance are most important points for the market in electric lamps here, for we are flooded with lamps with very short lives, as I know to my cost. An "All-Russian lamp" factory is now just starting in Moscow. . . . It is said that the duty on foreign lamps is to be raised, and this

may help it in competing with foreign lamps. The present duty is 30 roubles per pood. A pood is 36 English lb., but what a rouble is at present (30/13t. December, 1914) it is difficult to say. Before the war it meant 9·5 roubles for £1, but just now, it is about 11·70 for £1. This makes a big difference. Another trouble is that no banks are issuing foreign cheques, so it is impossible to transmit any money at present, but the local papers say that negotiations are on foot between the British and Russian Governments to arrange some *modus vivendi*, so as not to put a stop to all business. In the district of Kieff there are about 300 sugar factories . . . . they require a good lot of lamps. Commission must be liberal in Russia owing to the enormous distances to be travelled, and the hotel expenses, &c., not to speak of the well-known Russian system of bribery. Every order has to be bought. [This impression is discredited by other authorities.—Eds. E.R.]. In Western Europe one can see from one town to another, but here at Kieff it takes 12 hours in a fast train to get to anywhere—400 miles. Three days ago the railway fares and freights were raised 25 per cent., and refreshment still more, as no drink of any kind is allowed, so that all the profit has to be put on the food. Samples to Russia should be sent per Foreign Parcels Post—not by "Express Agents"; they will be here in about three weeks from date of despatch.

Another Russian correspondent (writing from Finland) lays great stress upon the importance of cheapness if British firms desire to capture the German trade in electric lamps. Unlike the above writer, he says that while British-made lamps are recognised as being "far better, giving a brighter light" than German, the cheaper article is preferred—"inferior quality seems no objection." He suggests that British firms should "use cheaper material and be on the competition line," as unless they can produce cheaply they will never do a trade there.

The Promotion of Russian Manufacturing.

The gradual awakening of Russian manufacturers to the necessity for rendering themselves independent of German products resulted in the holding at Petrograd, on February 12th, of a conference, which was attended by representatives from all large towns, of the electrical section of the Imperial Technical Association. As the chairman pointed out, one of the most important problems which had to be solved was to ascertain the factors which would enable the Russian technical industry to dispense with Germany; and this question was followed by a discussion as to the possibility of constructing various apparatus for telephony, telegraphy, and radiography, &c. In this connection it was mentioned that the electrical industry was almost entirely dominated by the Germans, who also controlled most of the patents used in electric lighting work. A great surprise was sprung upon the conference by the announcement that the mines in the district of the Urals, which furnish wolfram ores for the manufacture of incandescent lamps, are still in the possession of the Krupp company of Essen, and that the latter receives delivery of the metal itself at the price of 4 roubles per pood, as compared with the customary charge of 67 roubles per pood. The final result of the conference was the adoption of a resolution deciding to approach the Government with a request for support to the native electrical industry by all means available, in regard to Customs conditions, and freight rates.

Russia and Electric Lamp Production.

At the evening sitting of the Congress on the Russian Electrotechnical Industry on February 13th, Mr. A. V. Olshvang gave a report on the present position of electric lamp production in Russia. He said that at present the Russian factories in Moscow, Petrograd, and Warsaw, engaged in the production of electric incandescent lamps, put on the market an average of 20,000 carbon lamps per day, and about the same quantity of metallic-filament lamps, the aggregate being between 10,000,000 and 12,000,000 lamps a year. But, unfortunately, these so-called Russian lamps included nothing that was Russian except labour, for the Russian factories simply assembled the various parts that had been imported from Germany. The question was, could not Russia make her own lamps without appealing to the foreigner for the half products? He was of opinion that Russia certainly could do so, for she had the material, and all the details of lamp production were well known to her. But until the war broke out no one thought of taking up the production in Russia; in fact, there was no profit in it, for, thanks to the low Customs duty, the parts could be bought more cheaply abroad. No factory in Russia was equipped for making the bulbs, but recently the Russian glass factories had undertaken their production, and already lamps furnished with Russian-made bulbs had been put on the market. The tungsten filament, the most delicate and essential part of the lamp, had ceased to be a secret, and one of the laboratories in a Moscow factory was already producing it. Wolfram was found in Siberia, in the Urals, and in the Caucasus. The speaker referred to the Krupp influence, which was also mentioned at the meeting of the Imperial Technical Association, and said that at the beginning of the war, deposits of wolfram were being exploited by Krupp, who had leased them from a Urals industrialist through one of his agents. When the war broke out, Krupp's agent left Russia, and the owner of the deposits cancelled the contract with Krupp, and so, according to Mr. Olshvang, the exploitation of these deposits remained an open question. The lecturer added that this fact showed how important it was that deposits of minerals in Russia should be protected by the Government from foreign contractors.

One Russian factory had already begun the manufacture of filaments, and probably within four or five months lamps would be available that could properly be termed Russian produced lamps.

The tariff must play a great part in the development of the national production of lamps. Whilst on carbon lamps the import duty was 30 roubles per pood, *i.e.*, about 6 copecks (6 farthings) per lamp, or 20 to 30 per cent. of its cost, the duty on metallic lamps was not high enough, although it had been increased to 65 roubles per pood in respect to them. The position was that the first metallic lamps were somewhat large and not more than 500 went to the pood. But then Germany and other countries began to make miniature lamps, of which more than 1,500 went to the pood. So, whilst previously the duty on a lamp amounted to about 12 copecks (3d.) it became much less for the smaller lamps, making about 1d. each, *i.e.*, about 5 per cent. of the cost. Such an insignificant duty might seriously prejudice the development of the Russian lamp industry. The lecturer's observations closed with an appeal urging the need for exploiting Russia's deposits of wolfram, molybdenum, and nickel.

Rubber.

The market for rubber although showing a quiet tendency, has, nevertheless, maintained a very firm front, and there appears no reason to anticipate any material alteration in the general outlines of the position for some little time to come. The export movement of raw material from the Middle East is considerable, the official particulars of shipments of plantation rubber from the Straits Settlements in January being 2,576 tons compared with 2,334 tons in the previous month, and 1,181 tons in the corresponding month of the previous year. Considerable importance attaches to the progress of affairs in the United States, and the fears which had been acute that a quarter of a million men or so might be thrown out of work owing to the British embargo upon shipments of plantation rubber grown in British Colonies in the East, was promptly dissipated earlier in the year. From then onwards there have been regular shipments of the material made to the United States, and the consuming industries in North America are now more actively engaged than ever before. It can be taken as a fact that the American rubber trade is fully satisfied with the terms of the guarantees imposed in connection with the exportation of rubber goods to the Germans, Austrians and Turks, and also with the arrangements under which it is only possible to export goods to neutral countries by way of Great Britain. At all events, the United States' trade is not unduly hampered by the restrictions imposed, all of which are very necessary for the safeguarding of the British and their Allies, and there is no intention of conceding any points to the enemy in the rubber trade.

It is understood that an amalgamation is to take place between the Linggi and Port Dickson-Lumut Companies. This will certainly be a very interesting event, and one which should be of advantage to both parties to it. In a

recently issued report upon the International Rubber Exhibition of last year, the Ceylon Commissioner, Mr. Lyne, makes reference to the relative merits of plantation and fine hand Para rubber, and remarks that he was not able to get any admission from any manufacturer that plantation rubber was as good as fine hard Para where goods that would stand up against the severest tests were required. This is hardly fair, however, to the plantation product, for at least one of the largest rubber using concerns in the country is a strong believer in the cultivated article as against the wild material.

SEARCHLIGHT PROJECTORS.

By C. W. DENNY, A.M.I.E.E.

So much has been achieved in the development of the searchlight, that the latest projectors bear but little similarity in features or in size to the very early types. The writer proposes to give a short historic sketch of their uses and growth, including the numerous improvements which have brought the projector up to its present position of efficiency and utility. Projectors have been largely used for naval and military purposes, for night observations, and signalling, the latter operations being mainly carried out on a semaphore or Morse code system. An early type of projector designed for night signalling by use of a semaphore

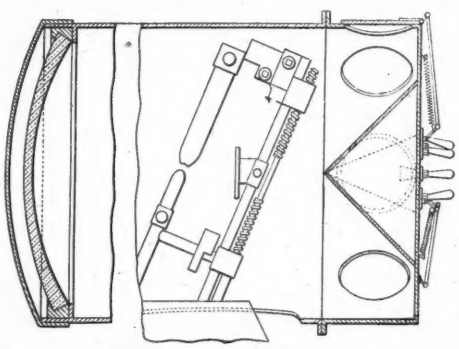


Fig. 1.—Early Form of Projector with Flashing Shutters.

system is illustrated in fig. 1, using a lamp with vertical carbons, as against the more modern lamps with horizontal carbons and flashing shutter. The construction of the lamp and body is characteristic of the early projectors; modifications are made with regard to the front, which allows of the direct issuance of the light-rays, the barrel is provided with an octagonal pyramidal reflector placed in the path of the light-rays, and having the apex of the pyramid facing the light. The sides of the pyramid are arranged to make an angle of 45° with the base. The effect of such an arrangement is that the light falling on the reflector is split up into eight beams, which are caused to travel in a direction at right angles with the original beam. The beam which travels vertically downwards not being required in practice, the corresponding reflector is omitted, so that seven beams are formed corresponding to the seven positions of the semaphore system. The beams of light are operated by doors or shutters on the external shell, which cover up the corresponding apertures, usually fitted with a concentrating lens to cause the rays to issue in a parallel beam. The doors or shutters can be worked electrically from a distance, or by hand by a suitable arrangement of levers. Many arrangements of mirrors have been devised for operating a system of semaphore signals as described above. Provision has also been made for injecting into the beams of light jets of steam, smoke, water, or vapour, with a view to rendering the beams more clearly defined.

The optical part of a projector being obviously of great importance, considerable attention has been given to various forms of mirrors, the most efficient and recent being the parabolic mirror, constructed of crystal glass, or, more recently still, of metallic construction, other notable forms of mirrors being the Mangin, aplanatic, and spherical. It is not strictly true, in the case of the latter, that all rays parallel to the axis meet at a point (the focus), and this irregularity (which is found in lenses also) is known as "spherical aberration." If the pencil of rays is small they may practically be supposed all to pass through the focus, but for wide pencils this is only so in the case of parabolic mirrors; hence their use for projectors. Parabolic reflectors were used as far back as 1763 for lighthouse illuminations by a Mr. Hutchinson, of Liverpool. These mirrors were formed of small facets of silvered glass made up as nearly as possible to a parabolic curve.

The most important improvement from an optical point of view has been the substitution of the gilded metallic mirror for the silvered glass mirror, either Mangin or parabolic. In the production of good metallic reflectors it has been necessary to overcome numerous difficulties, notably those incidental to the design and construction of special machines for working up the parabolic metal pieces, as machines formerly used for glass mirrors could no longer be employed. After working up, the mirror should be polished carefully, and covered with a fairly thick deposit of gold, all of which presents difficulties corresponding to the dimensions of the mirror. Experience has shown that gold-coloured metallic mirrors in clear weather give results comparable with glass mirrors, and as soon as the weather becomes foggy the gilded reflectors are superior to silvered glass. The advantage of metallic mirrors, from a military point of view, are incontestable. They present, besides a complete resistance to variations of weather and temperature, the advantage of withstanding shocks from gun fire, and they can be pierced by bullets without the intensity of the beam being sensibly diminished. A further advantage in favour of metallic mirrors is that of weight, they being considerably lighter than glass mirrors. The weight of a 26-in. metallic mirror is approximately 30 lb., whereas that of a glass mirror of the same size is about 165 lb. The employment of metallic mirrors also permits of much shorter focal lengths than are permissible with glass mirrors, owing to the intense heat generated, which would result in blistering the silver on the mirror, or even breaking the glass if in close proximity. Having found that, especially with horizontal carbons, the central zone of the mirror is practically useless, a central aperture is made in the mirror with a view to rendering more efficacious the ventilation of the silvered surface (in the case of glass mirrors); this also facilitates the manufacture, and enables the mirror to better resist air pressure due to the discharge of heavy guns. Mirrors, whether of metallic construction or of crystal glass, are usually fixed to the body of the projector in an easily detachable frame, to allow of rapid inspection and cleaning operations.

One of the earlier methods of focusing a projector lamp was to move the mirror in relation to the arc, the mirror being mounted in a movable frame or carrier arranged to move parallel with the axis of the projector. The later, and more approved method, is to move the lamp in relation to the mirror. This is usually accomplished by having the lamp mounted on guides or runners and attached to an adjusting screw or handle, by means of which the lamp can be moved in either direction at will. This arrangement has the advantage of rapid manipulation, and it can also be used to produce a divergent beam. This is obtained by varying the relative distance between the arc and reflector, which can be done by a few turns of the handle supplied for that purpose, the movement changing the light from a straight beam to a widely-divergent beam, or *vice versâ*. A much more effective method lies in the use of dispersion lenses, sometimes called "divergers," which consists of strips of plano-convex glass, set in a suitable frame for slipping over the front of the projector, or arranged to swing across the beam of light. The rays in passing through these strips are first converged, or brought together, and then, as the rays cross, they spread out again, and continue to spread indefinitely. The effect when placed in front of a searchlight is to spread the light out in the shape of a partly-opened fan. The light is spread out horizontally, but not vertically. The light when thus spread is not so penetrating as a parallel beam. Many forms of dispersion lenses are arranged in a separate ring or mounting, which, when required, has to be fixed over the main glass door. This has always been a troublesome

operation, and after being used a few times the usual practice has been to put the dispersion lens door carefully away and never use it again, notwithstanding the great convenience resulting from its use. A novel method of fixing dispersion lenses inside the barrel has been adopted on some projectors of American design. The lenses in question are arranged in two semi-circular brass rings so pivoted that they can be swung round a vertical axis. On the top of the barrel are provided two brass handles, by means of which the lenses may be swung into position or out, as desired. This takes but a few seconds, and the front door need not be opened. The dispersion lenses when out of use lie in a vertical plane parallel to the beam, and, being of very small section, do not interfere with the efficiency of the beam to any appreciable extent. The usual angles of divergence for, say, a 24-in. projector are 16°, 20° and 30°, other angles being easily obtainable for special requirements. Modifications in the dispersion lenses meet the requirements of the Suez Canal regulations, which stipulate that all ships traversing the Canal at night by means of searchlights shall project a beam of light forward which shall have a shadow in the centre of 5° divergence.

The bifurcated beam thus required has been produced in several ways, some designers preferring a system of metallic strips or shutters placed in front of the dispersion lenses, while others prefer a series of prismatic lenses.

Flashing Gear.—This can generally be brought under one of two classes—internal or external. The internal flashing shutters were mostly used in conjunction with the vertical carbon lamp, and were usually in the form of a plate or disk of suitable shape arranged to intercept the rays of light between the arc and the mirror.

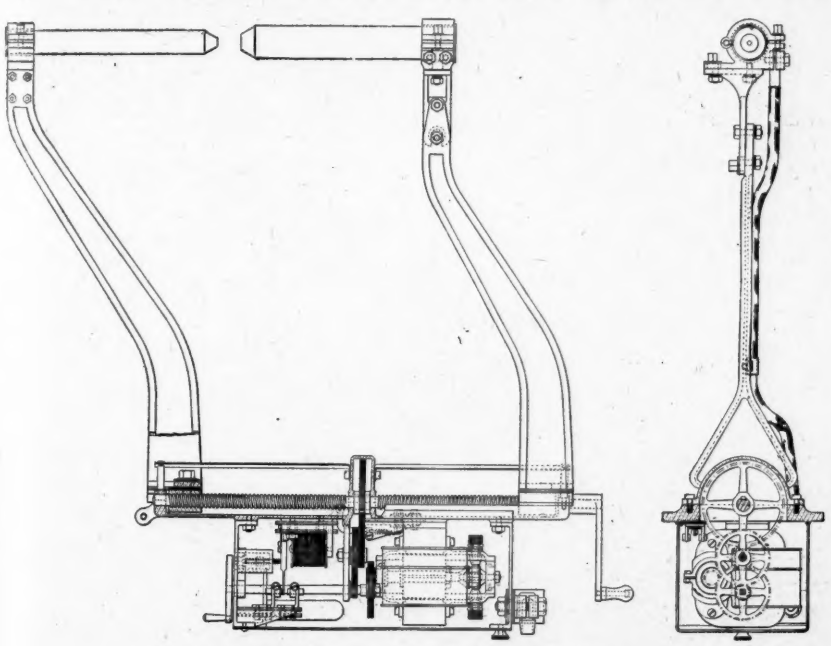


Fig. 2.—Motor-driven Projector Lamp.

Flashers of this type had numerous drawbacks, the most prominent being the formation of shadows in the beam when the flasher was out of use. These shadows were caused by the flasher plate or its fixings coming within the cone of rays thrown on the mirror by the arc, so that the efficiency of the beam was materially affected. Also the more general use of projector lamps with horizontal carbons makes it difficult to design any really good arrangement of internal flashing gear. The external flasher, consisting of a series of Venetian shutters in front of the door, entirely eliminates his trouble.

Projector Lamps.—The earlier types of projectors nearly all used a lamp in which the carbons were in an inclined position; the result was that the carbons, carbon-holders, and supports caused very bad shadows in the beams of light. The horizontal carbon lamp is now almost universally adopted for projectors. The use of this type of lamp materially adds to the efficiency of the projector, in that there are no bad shadows produced on the mirror. The lamps are usually of the differential type, operated by a shunt and a series coil, much in the same way as an ordinary vertical arc lamp, the feed mechanism necessarily being modified to suit the requirements of a horizontal position. The carbons are fed by means of a screwed rod having a right and left-hand thread, and actuated by means of a shunt coil through suitable pawl mechanism. Motor-driven projector lamps have been in use, mostly on the Continent, for some 15 to 20 years. An illustration of a motor-driven projector lamp is shown in fig. 2.

(*To be concluded.*)

AN ELECTRICALLY-CONTROLLED CANAL BRIDGE.

Acting conjointly, the Corporations of Glasgow and Clydebank have had constructed over the Forth and Clyde Canal, at Dalmuir, a swing bridge which is claimed to be the first bridge in the world where the whole of the functions of opening and closing the bridge and the road, and controlling and safeguarding the vehicular, pedestrian and waterborne traffic, are performed electrically by one man operating from one position. The bridge consists of a single swing span constructed of steel, with a roadway 20 ft. wide between the girders and two footpaths, each 5 ft. wide, carried on brackets projecting outside the main girders. A double line of tramway is laid on the roadway, and the overhead tramway conductors are carried by light girders with supporting columns on either side of the bridge.

It was at first thought to be impossible to operate the gates, locking bolts, bridge bolts, jacking gear, runaway points, and signals electrically, and a system of mechanical bell-cranks and levers was suggested, similarly to other swing bridges. Obviously a bridge so arranged would have required a larger staff to operate it than is necessitated by the electric control system that has been adopted.

A scheme for the complete electrical operation was put forward by the Igranic Electric Company, and the obvious practicability of this scheme so favourably impressed the consulting engineers (Messrs. Crouch, Hogg & Easton) and the authorities (The Caledonian Railway Co., and the Glasgow and Clydebank Corporations) that it was decided to ask several of the most prominent electrical engineering firms to put forward electrical schemes.

Ultimately that originally put forward by the Igranic Electric Co. was adopted, this firm having had considerable previous experience in the operation of swing and Scherzer rolling bridges. The main objects of the scheme were:—(1) The safety of the public; (2) To make the bridge so fool-proof that it could safely be operated by unskilled and consequently inexpensive labour, and to arrange the operation so that only one man would be needed to do everything necessary for opening or closing the bridge and gates, and that he could operate from one position.

It thus dispenses with the services of two other men, who, under a mechanical scheme, would have been necessary day and night to open and close the road gates, &c. For this purpose the whole of the operations are put under the control of a small master switch in the bridgeman's cabin. This master switch is of the most simple and mistake-proof character. It consists of a small metal box

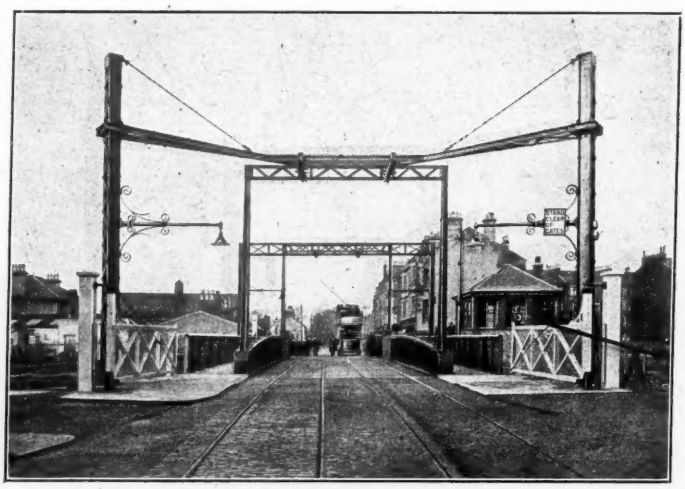
having a vertical handle which is moved in one direction to open the bridge, and in the opposite direction to close the bridge. On the box are marks on each side of the centre, showing the position to which the handle should be moved for each successive operation of opening or closing the bridge. This master switch is the only piece of apparatus that has to be manually operated, all the rest of the controlling gear being automatic.

The sequence of operations is as follows:—Assuming the bridge to be closed to canal traffic. To open the bridge the operator moves the master switch handle to the first position in the direction marked "open." This first sets at "danger" a semaphore signal at each end of the bridge, and causes a loud ringing bell to sound in the road at each end of the bridge and up the side street. Until this bell has rung for a predetermined time (say 10 seconds), nothing further can be done, no matter how the operator moves the master handle. When this period has expired, it is possible, by a further movement of the master handle, to open the runaway points so that a runaway tramway car could not run on to the bridge or into the canal, but would be turned on to side lines.

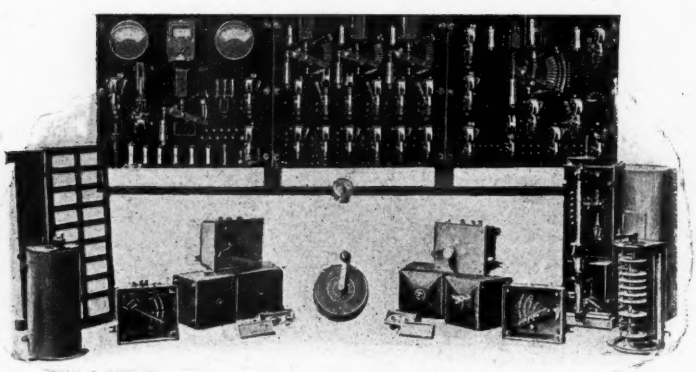
A further movement of the master controller handle switches the electric current from the tramway overhead wires on to the switchboard in the machinery house, so that it is available for turning the bridge, and the overhead wires on the bridge are at the same time made dead.

On moving the handle to the next notch, the road gates on the east side of the bridge are started in the closing direction, and this movement continues until the gates are within, say, 18 in. of being closed, when they automatically stop. The gates on the west side are then nearly closed in like manner, and after this it is possible to entirely close first the eastern pair of gates, and then the western. The object of this intermediate partial closing of the gates is to prevent the possibility of a child or a careless or intoxicated person being caught and squeezed between the gates. The gates, having been closed, are automatically locked in position.

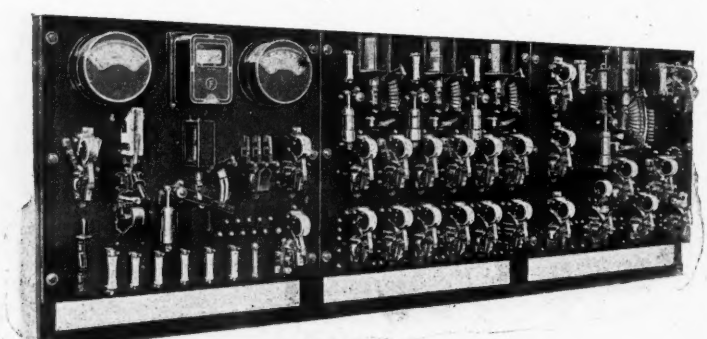
A further movement of the master handle unlocks the bridge bolt, which is used to keep the rails on the bridge in correct alignment with those on the road, and when this bolt has been withdrawn, it it possible by a further movement of the master handle to start the jacking motor so that the jack is unscrewed. (This jack is used to take the weight of roadway traffic when the bridge is closed and prevent any movement of the bridge while traffic is passing over it.) The bridge is now ready for swinging, and the master handle being moved to the next position the bridge motor starts and the bridge swings in the opening direction. When it is nearly open, it is automatically slowed up and finally stopped without any jar against the abutment, and this slowing and stopping are entirely automatic and demand no care from the bridgeman. The master handle can now be moved to the central position again ready for closing the bridge. To close the bridge the operator would move the master handle step by step in the opposite direction to that for opening. It is impossible either when opening or closing the bridge to do anything out of the proper order, no matter how the master controller handle is operated, as the various functions are so interlocked that improper or impatient operation only stops the process of opening or closing and compels the operator to confine himself to the proper method. For example, should the operator impatiently move his master handle forward to commence any movement of the machinery before the proper preceding movement has been entirely completed, he would only succeed in stopping all movement until he moved his handle back to the correct position and proceeded in the ordained manner. He is kept informed of the completion of each movement by a visible signal given



Electrically-Controlled Canal Bridge at Dalmuir.



Group of Bridge Control Gear in Works.



Main Control Panel.

Master Control Switch.

automatically on an illuminated indicator in his cabin. The operator can, in case of emergency, stop any operation at any point and can even, if necessary, reverse it. Furthermore, he can at any time sound the loud alarm bell by merely pressing a button.

Every operation is performed by electrical means and the design is such that any failure of the electrical supply or any breakdown of any part of the gear can at the utmost only stop the operation of the bridge, but cannot produce improper operation and thereby lead to an accident.

A bridge on similar lines is under construction at Kilbowie Road, Clydebank, in connection with the tramway extensions from Clydebank to Drinbocher.

LEGAL.

Ruthenberg *v.* British Abrasive Wheel Co.

(*Concluded from page* 315.)

The plaintiff was called, and in the course of his evidence said that the insulation was not first class and suitable for the pressure which it had to withstand. He was unable to account for the breakdown. He went to the works of the defendants in company with Mr. Swinburne, the well-known electrical engineer, to make tests. They were met by Mr Strover, on behalf of the company, who told them that the asbestos cloth insulation for the water-jacket had not arrived. When the asbestos cloth did arrive Mr. Strover and his assistant proceeded to wind it round the electrodes, and bound it with what was known as broom-wire—an iron wire coated with tin. The work was not satisfactory. It was a continuous wire, and when it broke the whole uncoiled. It broke immediately they tried to put the electrodes into the jacket. They could only get two electrodes in, and Mr. Strover persisted in using a stump 18 in. long. When remonstrated with, he said he could not afford to throw the stump away. Witness saw the stump brought from the waste dump, where it had been thrown away. It was not possible to get a whole carbon in, and witness was so anxious to get the test over that he agreed to run with the stump. Witness described in detail the manner in which the test was carried out, and said that the manner in which the test was made was responsible for the failure of the furnace to work properly. Mr Strover, when the test had been made, said the pump was no good, the furnace was no good, and he (witness) was no good. He (witness) agreed that it was useless to carry on the test under the circumstances.

On March 3rd further evidence was called in support of the plaintiff's case.

Mr. Ernest Robert Watson related the steps which had been taken by him to test the transformer. He said it was wound for a high voltage. It broke down owing to a leakage from the bottom.

In cross-examination, he said that assuming proper precautions were taken there would be nothing improper in putting it to a test of 9,000 volts.

Mr. John Pinnock, foreman at the machinery department of Tangye & Co., described the test to which he had put the "jack." He said that he had subjected it to the hydraulic test of 8¼ cwt. to the sq. in., which was equal to a carrying power of 3¾ tons.

Wm. Bishton, also employed by Tangye & Co., also gave evidence as to other tests.

Mr. Clavell Salter, K.C., in the course of his opening for the defence, said that the contract having been made, the defendants took works on the Tyne where they were going to manufacture the abrasive wheels, and waited for the furnace to come, but it was not delivered until long after the contract time, and when delivered, he contended, it was a worthless thing. A plan was submitted to Mr. Strover, and after examining it, he said in fact, "go ahead," but that could not relieve the plaintiff of responsibility. The specification sent was, in fact, for a wholly different furnace. Mr. Ruthenberg asked for £500 before delivery was complete. The defendants asked for delivery of the remaining parts, but plaintiff disclaimed any guarantee, and said that the furnace as ordered had been delivered, the other parts referred to being outside the contract. The other parts arrived in due course, and the furnace having been erected the power people required to test the transformer, and they submitted it to a fair and proper test under which it broke down. That involved a delay of 10 days for repairs, and it had stood the test afterwards and had been at work since. When the furnace was delivered it was tested, and the result was complete failure, no commercial result being obtained. With the exception of the hood, the furnace was the ordinary electric furnace, and the hood seemed to be an encumbrance rather than an advantage. It was not suggested that the furnace, as worked by the defendants, was a hopeless failure, but as supplied by the plaintiff it was.

Some evidence was called in support of counsel's statement.

On Monday, March 8th, further evidence was given for the defence.

Mr. E G. Strover related the various experiments he had made at the works of the defendants in order to make the furnace effective.

In cross-examination, he said that on July 26th the furnace was erected, in accordance with the plans, with the exception of the electrodes. On August 26th, he said, they had an explosion, after which he took off the water-jacket. He continued working with the outer shell until September 25th, and then he took the hood off. Subsequently he made various other changes. Witness admitted that the correspondence showed that the plaintiff objected to the removal of the shell or jacket, and that he (witness) had said that it had been removed for the time being because it was in the way. He removed it before it had been tried.

Other witnesses were called, and the hearing was again adjourned. On Tuesday, after counsel's speeches, the Referee gave judgment for the defendants on the claim and counterclaim, with costs, and judgment was entered accordingly.

British Insulated and Helsby Cables, Ltd., *v.* Crittall Manufacturing Co., Ltd.

In the Official Referee's Court, on March 1st, Mr. Muir Mackenzie commenced the hearing of an action for the recovery of £544, the price of an electric welding machine, &c. The defence set up a counterclaim for breach of contract, the defendants alleging that in view of the contract being carried out they purchased a motor and generator and other electrical plant in connection with the welding machine, at a cost of £283. The defendants also claimed for expenses incurred in setting up and testing the machine. They contended that the machine did not comply with the specifications and description contained in the contract, and that it was totally unfit for welding casement frames. The machine, at the request of Messrs. Bullock, acting on behalf of the plaintiffs, was returned for further tests and alteration.

Mr. Greer, K.C., for the plaintiffs, said there was no dispute as to the order having been given or as to the delivery, and subject to the counterclaim the plaintiffs were entitled to judgment for the amount due. The defendants contended that as the welder had not complied with the contract they were not liable to pay for a copper and rubber cable. The plaintiffs were, said counsel, manufacturers of electric welding machinery, and they had had during the past 20 years considerable experience in that kind of work in this country. The defendants, who were makers of metal casements for windows, got their material in bars, which had to be welded together in order to form the frames. Up to the time when they purchased the plaintiffs' machine, they had welded their bars by means of gas blowpipes, which was not nearly so efficient as the process of applying heat by means of electricity. What the defendants complained of was that the plaintiffs had undertaken within a given time to deliver a machine which would weld casement metals with a minimum of errors, and this, they said, the plaintiffs' machine did not do, and that further time was allowed the plaintiffs in which to complete the contract, which they failed to do. Counsel detailed the circumstances which led up to the contract and explained that the delays complained of were brought about by matters which were outside the contract. The defendants, for instance, he said, failed to send the materials which were necessary for making the test under the contract. Another cause of delay was that there was no permanent power plant upon the works. There had been a fire on the works, and the insurance company did not approve of the temporary plant introduced. He contended that the plaintiffs had produced a satisfactory machine, and he suggested that the Referee, with experts representing each side, should visit the works and see the machine at work.

The Referee expressed his willingness to see the machine, after hearing the evidence, and before giving judgment.

Mr. Sidney Chas Bullock, manager of the electric fitting department of the plaintiffs' firm, gave evidence in support of the plaintiffs' case. He said that the plaintiffs experimented upon bars sent to them by the defendants in September, 1911, and explained how the welds were made, with results which proved satisfactory when they were submitted to the test of force. Where the welds did not prove satisfactory, it was owing to the parts being of different dimensions. He pointed out to Mr. Crittall that he could never expect to get satisfactory welds with bars which varied in thickness to such an extent as those that had been submitted for test.

In cross-examination as to the importance of the variation in the dimensions of the bars, the Witness said that where the ends of the bars did not come into close contact with the clamps, the parts did not heat equally, with the result that an imperfect weld was formed.

On the hearing being resumed on March 3rd, the Referee said he would like to see the machine at work, but it would not be convenient for him to visit the works until Tuesday this week, and in the meantime the evidence in support of the plaintiffs' case might be completed.

Mr Greer, K.C., said it might not matter whether the machine was now in a complete condition, as, technically, the defendants might say they were entitled to refuse the machine because it was not demonstrated at the time; but even that would not entitle them to throw upon the plaintiffs the cost of the experiments.

Mr. Paul Bucher, manager of the plaintiffs' electric welding shop, a position which he said he had held for eight years in the course of his evidence described the manner in which the welding was carried out in the case of a printer's chase, the machines for which he had designed and carried out himself. In that case, he said, the material was cold-drawn steel, and at the welded corners the bars were square cut. Before doing the defendants' work he had had no experience in making metal casements. The metal sent to be welded in the first instance differed from that supplied after the machine was delivered to the defendants, and the clamps previously used would not do for the material supplied later.

Clamps were very important in a welding machine, and he could only make the clamps by having the materials to be worked upon, or dimensioned plans.

The hearing was again adjourned.

On March 4th, evidence was given by Dr. Brislee, the British Insulated Co.'s analyst, as to the result of his analyses of the metal submitted to the plaintiffs for the experimental working of the machine. He said that the result of his analyses was that an excess of sulphur existed in the metal, and that that excess was prejudicial to good welding. There were other chemical constituents in the metal in addition to iron, and he was not prepared to say that the fault was attributable to any one of them alone; but for the purposes of electric welding an excess of sulphur in the metal was a fault which prevented good welding. There was an essential difference between electric welding and welding by gas. The Cable Co. were great experts in electric welding.

Mr. D. Sinclair, electrical engineer and general manager of the plaintiffs' works, said that he had occupied that position since July, 1902, and before that he was 20 years with the National Telephone Co. He had had a wide experience in all varieties of electrical machinery for many years as a buyer, and later as a seller. The turnover of the Cable Co. was in the vicinity of two millions per annum. He took no active part in the designing or preparation of the machine in question; but when the difficulty arose he received a personal letter, in consequence of which he had an interview with Mr. Crittall, sen., at which Mr. Bullock, Mr. Harris and Mr. Bucher were present. The result of the meeting was, more or less, a compromise. Mr. Crittall had refused to pay some money which he (witness) thought had nothing to do with that particular transaction. The money was overdue from another account, and Mr. Crittall ultimately agreed to pay it. Upon that the machine was discussed as well as the size of the iron used for making the frames. It was agreed that the machine should be returned to the works, and that the defendants should supply the company with samples of such iron as they could buy commercially, and the company, on their part, agreed to do all that money and skill could do to make the machine properly. He believed it was understood that a reasonable inspection of the machine would be made by the buyer in conjunction with the company's experts, and he believed that at that time both parties thought they could be satisfied.

Mr. Bucher was recalled for further cross-examination, and in answer to Mr. Colam, he said that the novelty of the process of electric welding was that by using a great amount of current in excess of the carrying capacity of the metal heat was generated and the metal melted. The process was a speciality, but there was no difference in principle between the company's process and the process which was in use by German and American firms.

On Friday, March 5th, Mr. Harry Hughes Harrison, A.M.I.E.E., was called. He said that he was engaged as engineer at the London office of the plaintiff company, with whom he had been for over nine years. He first came into communication with the Crittall Company in 1911, and previous to that date he had not made any mitre welders. He referred to a number of interviews which he had had with the defendants as to the possibility of making successful mitre welds, which ultimately resulted in the contract. After that date he had no further negotiations until June, 1913, and then it was with regard to a compromise. At that time it was pointed out to Crittalls that there were difficulties in regard to the heating, owing to the variations in the bars, and that it would be necessary to provide a modified design of clamp. Mr. Bullock had stated that he and Mr. Bucher had discussed such modification, and that they were confident it would be successful, but that it would involve a decrease in the rate of output. The amount of decrease was not mentioned, so far as he remembered, but Mr. Crittall stated that they badly wanted the machine.

Mr. Colam, K.C., in stating the case for the defence, said that while experimenting with the machine they were honestly trying to get it to work. He pointed to certain alleged defects, and said that if the defendants were captious, and were trying to get rid of the contract, they would have at once told the plaintiffs to take the machine away, instead of trying in every way to remedy the defects, and this contention he supported by letters which had passed between the parties.

The hearing was again adjourned.

Tungsten Drawn Wire.—Petition for Licence.

(*Continued from page* 315.)

Evidence was given on behalf of the petitioners.

Mr. Cecil Douglas Falcke, secretary of the Robin Electric Lamp Co., stated that the Association's list price for lamps with a voltage of 200 to 250 was 2s. 8d., and for lamps of a low voltage 2s. 2d. The Association firms issued rules for the re-sale of tungsten lamps.

Mr Cave called upon the other side to produce a copy of these rules.

Mr. Walter said he did not care for the Tungsten Lamp Association. He did not produce the rules.

Mr. Cave said witness had obtained what purported to be a copy. This was handed to the Judge, together with the price lists of the "Mazda," "Wotan," "Osram" and "Ediswan" lamps, which showed that the prices were all the same.

Mr Falcke said his company gave an experimental order for lamps in squirted wire, and these were made at 1s. 4d. each for low-voltage lamps, and 1s. 6d. each for high-voltage lamps. Messrs. Siemens made lamps for them with a voltage of 105 at the price of, he thought, about 1s. 8d.

Cross-examined by Mr. Walter: His company wanted to work under the Siemens and B.T.H. Co.'s patents, but they had no process at present and were not making any lamps. His company had obtained an estimate for the establishment of a complete factory for making lamps and wire. This was about £25,000. The cash capital of his company was £10,350. The company was promoted by the R. F. Syndicate, which was then taken over by the company with its British and foreign patents for 50,000 £1 shares. Two-filament lamps might be old, but the idea of their cap was new. His company's patent cap could be fitted to the lamps made by others.

Mr. Walter: Your ingenious idea is for a clip round a lamp, to take 1s. 2d. as the cost and sell for 2s. 10d. less the discount to the trade, and net a profit per lamp of something like 1s. You now desire to come in after all the pioneer work has been done with a licence to start where others have ended?—That is not our fault.

Witness said his company intended to make lamps in all the standard voltages and candle-powers.

Cross-examined by Mr. Colefax, Witness said they rejected an offer by the Siemens Co. as wholly unreasonable, namely, 1s. higher than the list price.

Mr. Spencer Flower, a director of the petitioning company, said they would prefer to buy their drawn tungsten wire from one of the patentees, but if they got a licence they were prepared to make their own. They would have no difficulty in getting competent employés and in getting capital if the present obstacles were overcome.

Cross-examined by Mr. Walter, Witness said the original purpose of the company was to buy wire and get lamps made for them, but whether they afterwards made lamps themselves was a question of policy. It was never their intention to import lamps. Their intention was to fix the price at the same figure as lamps were being sold at. They might charge a few pence extra.

Mr. George Hookham, of Birmingham, stated that he was interested in the Robin Co., but was not a director. He had no doubt as to the practical utility of the Robin lamp, or as to the reception it would meet with at the hands of the public if it were put on the market at a reasonable price.

Mr. Joseph T. Robin, the inventor of the Robin lamp, said that in an interview with the representative of the Siemens Co., the latter said they were very anxious to get the order for making the lamps, but they had to make conditions as to the price. The Tungsten Lamp Association wanted them to impose a price of 2s, higher than the list price, instead of 1s., but as the result of negotiations, the Association agreed to reduce the charge to 1s. more than the list price. The price was fixed on the amount of the discount, but he knew that bigger discounts were being quoted to other people. The Robin Co. had several customers waiting for their lamps.

Cross-examined by Mr. Walter: His company had considered the question of importing double-filament lamps, also wire. As to what would be a fair profit, it would not be fair to sell for more than the Tungsten Lamp Association obtained, because they thought that the Association were making too much money out of their lamps.

Re-examined by Mr. Cave, who asked if he had any idea of the profits made by the members of the Association, Witness said he had the word of one of the principal directors in Berlin of the company which made the Osram lamps that the profits were very high.

Mr. S. Biheller, of the firm of Weiss & Biheller, Chiswell Street, E.C., said he could get Austrian and German lamps for re-sale abroad at 6d. each. This would be the same type of lamp as was here charged 2s. 2d. for. He could compete with the Association in China and Australia by buying lamps at 7½d. each. The standard retail price for similar lamps in Germany was 1 mark 50 pfennigs.

Cross-examined by Mr. Walter: He did not sell in this country the lamps he bought at 6d. each because of the existence of the patents. In Canada they were sold to dealers at 18 cents each, and to the public at 40 cents each.

Messrs. Thomas Rose and L. J. Simon, electrical engineers, gave evidence as to the advantages of the Robin lamp. Mr. Rose said the price for drawn tungsten wire sold by the General Electric Co. in the United States was $5 per 1,000 ft.

Mr. Matthew Adams, an electrical expert who advised the petitioners on the wire patents which he had selected for inclusion in their petition, then gave evidence. Drawn wire, said Mr. Adams, reduced the cost of making up the lamps by not requiring so many joints in the filament.

What about the brittleness in the hands of the consumer?—It is less in the drawn wire than in the pressed wire. In time there is a tendency to crystallisation which tends to reduce the difference between drawn wire and pressed wire.

Have you found any country in the course of your inquiries outside the United Kingdom where the lamps have achieved so large a rise in price as in the United Kingdom?—No.

In your opinion is the price in the United Kingdom due to the merit of the lamp or other causes?—I think it is largely due to the great advertising of the people who had it in hand.

On the subject of competition, Witness said the putting of two groups into one combination restrained competition. In the competitive market royalties varied from 1 to 5 per cent. on the net selling price. He had known the royalty go as high as 10 per cent., but in a highly competitive field 10 per cent. would strangle a market.

Would the Robin lamp with tantalum have a reasonable prospect of success?—No, because tantalum has gone so much out of use that the public demand is relatively small.

Is the tungsten drawn wire important for commercial success?—Yes.

Mr. Adams, in reply to further questions, said he gave an order in Italy for drawn-wire lamps, and was supplied with six "Z" lamps and six Phillips. The lamps were shown to his Lordship, who observed that the "Z" was priced at an English equivalent of 8d., and the Phillips at about 8¼d. Witness said these were the retail prices in the Italian market. As to the uses of tungsten which witness was asked about, he said he could not see why tungsten should not be used more than steel for some purposes, because it gave greater strength than steel and was non-corrodible. Tungsten wires might, for example, be used for piano strings, and if there was an industry in the wire there would be many industrial applications of it.

This closed the petitioners' case, and Mr. Cave summed it up. Whatever test, said Mr. Cave, was applied to the price of 125s. asked for the wire, that price was unreasonable, and it was wholly impossible to justify it. The petitioners were willing to take their relief on any reasonable terms, but his Lordship could not, under the Act, fix the price of the wire. They were willing to take a licence to make the wire only for the purpose of selling their lamps, upon the terms of paying a percentage on the sale price. Why should the Robin Co. not get a licence on the terms granted to the Ediswan Co.? They were also willing to import the wire and to pay a royalty upon every metre imported. The Court had never looked with favourable eyes upon combinations of the kind engaged in the tungsten wire business. They were not illegal, of course, but they were prejudicial to the interests of the public. He submitted that the petitioners had made out a case for a compulsory licence.

His Lordship intimated to Mr. Walter that he desired to hear him on the evidence that had been given.

Mr. Walter said certain sections of the Patents Act were imposed on patentees who were unreasonable, but the case contemplated by the sections had not been attempted to be made out by the present petitioners. They had put their case not on the ground that the public were in any way hurt, but that they, the petitioners, were refused a licence, and that the true construction of the sections was that anyone might have a licence under any letters patent, and that the desire of an individual to work under the patent was sufficient to justify the Court granting a licence. The petitioners' case must be put as high as that. They said they would like to have a licence under a group of patents which covered a large number of alternative methods of working, and then they would elect what they would do. There was no evidence of any existing trade or industry being unfairly prejudiced, or of any new trade or industry being unfairly prejudiced. Neither was there any evidence of any demand for the tungsten wire except by this company. The petitioners wanted to reap where others had sown by adding a small improvement to an existing invention and obtaining the benefit for themselves. They did not say under which patent they wanted to work, but they came to the Court for a general licence.

Mr. Colefax said his clients, Siemens Bros., were the owners of three patents, and the patented article in respect of each was different, because the process was different. No default on the part of his clients had been proved as regarded the manufacture of the patented article. Messrs. Siemens offered the petitioners to make their lamps on terms that were not unreasonable. The petitioners gave it out that their lamp would be a double-life lamp, and that was the basis on which they were going to conduct their business. It would be a great injustice to the Siemens Co. if the petitioners were to be put in a position of being able to come into the market, and with a lamp that was going to last twice as long as a single-life lamp and sell at the same price. The Siemens Co. therefore said to the petitioners: "We will supply you with the lamp, and all we ask of you is that you shall sell it at not less than 1s. above the single-filament lamp." That was not an unreasonable request.

His Lordship, in reserving his judgment, said that if he desired to hear the respondents' evidence, he would give counsel notice and fix a day.

R. L. Jones & Co., *v.* Orpheum, Ltd.

Mr. Verey, one of the High Court's Official Referees, on Friday March 5th, commenced the hearing of an action in which plaintiffs, a firm of electrical engineers carrying on business at Teddington, sought to recover from defendants, a Cinema Theatre Co., running picture palaces in various parts of the country, the balance of an account for electrical fittings, &c., for a theatre at Croydon.

The claim, said Mr. Woodcock, who appeared for the plaintiffs, was divided into two parts, the first two items of £50 each coming under a general contract for fitting up the theatre, a contract which provided for payments upon architect's certificates, and as to those he (counsel) contended that it was not competent for the defendants to go outside their contract. The other item of £46 11s. was for an electric motor and gear for raising the curtain, which was outside the contract work, which was to be done for £298. Specifications and an estimate were submitted by the plaintiffs, and approved by Mr. Gilbert Booth, the defendants' architect, who wrote an acceptance, the plaintiffs' undertaking being to do all the work of electric lighting and installing plant at the theatre. The work proceeded, and payments were made from time to time on certificates; but, notwithstanding the certificates, the defendants now sought to go behind them, and defended the claim on the ground that the work was not carried out according to contract, and that it was negligently and improperly performed. On particulars being applied for, they said that the motor-generators were not fixed so as to avoid vibration, the result of which was damage to the building, and noise causing annoyance to the audience. The generators, said counsel, were fixed under the supervision of the defendants' own architect, who chose the places where they were to be fixed, and he would not allow the generators to be bolted into proper cement-beds. If there were vibration, counsel contended, it could easily have been remedied, and throughout the whole of the correspondence he could find no complaint in regard to them. It was not until particulars were filed in the action that any complaints were made about vibration. Defendants further complained that the motor-generators sparked badly, but plaintiffs said that if there were sparking, it resulted from proper attention not being given to the machines. When fitted they were not sparking unduly, and were showing no signs of defect. The plaintiffs supplied Newton generators, which were the best on the market. The architect was satisfied, and there was no suggestion by him that they were not what they should be. Then the defendants said that the lighting was defective, but that was denied by the plaintiffs, who stated that any small defects were remedied at once. All the small matters complained of had been remedied, and no complaint had been made afterwards until affidavits were filed under Order 14. The work was duly passed by the local authorities, by the lighting authority, by the police, and by their own architect. There was, moreover, no condition in the contract as to the silent working of the motor. It was quite impossible, where a curtain motor was placed inside the theatre, to avoid some noise, and consequently the common thing was to have the motor placed outside. In this case the architect had to say where it should be placed, and he chose a place under the stage, although it was pointed out to him that there might be noise owing to the stage acting as a sounding board.

Some evidence was given in confirmation of the statements of counsel, and the hearing was adjourned until Monday, March 15th.

Sinclair *v.* Levinsky.

In the Shoreditch County Court on Friday, before his Honour Judge Cluer, Charles Sinclair, trading as the MacFarland Electrical Co., of 83, Camberwell Road, S.E., sued Abraham Lavinsky, of Canonbury, to recover £63 10s. for electrical goods sold and delivered for the Dalston Playhouse Cinema, Kingsland. The case had been remitted from the High Court.

Mr. A. E. Robinson appeared for the plaintiff, and the defendant in person.

It appeared that arrangements were made to build the cinema, and Messrs. Gasson, Cockerill & Co., Ltd., got the building contract. Payment had mostly been made by bills, accepted by a Mr. Davis, who made the contract, and had formed the subject of High Court actions. It was alleged that although Davis was the signatory to the contract, the real one concerned was the defendant, whom, it was quite understood, was financing Mr. Davis. The electrical goods concerned in the action, it was suggested, were extra to the building contract, and the defendant himself chose them and ordered them, together with Mr. Davis.

The Plaintiff gave evidence as to this, and said the only one he recognised in the matter was the defendant, who was introduced to him by the architect. It was true Mr. Davis was present when the goods were selected, but he appeared to be in the position of adviser, as the defendant did not appear to understand things thoroughly, but nothing was ordered except with the sanction of the defendant.

Mr. Ernest Cannell, the architect, said the defendant said he would see that the plaintiff was paid every penny. The builders refused to order the electrical fittings, as they said they were extra to the contract. Had the work gone through the builders it would have cost 10 per cent. more—their profit.

After a good deal of detailed evidence had been given, judgment was entered for the plaintiff, with costs.

A Question of Discount.

In the City of London Court, on March 5th, before his Honour Judge Rentoul, K.C., Mr. George Braulik, electrician, 8, Lambeth Hill, E.C., brought an action against Mr. E. C. Goodfellow, electrician, 28, High Street, Highgate, to recover £1 17s. 5d., being the balance of a substantial account for electrical accessories supplied. The defendant said that when the plaintiff executed his various orders it was agreed that he was to have 5 per cent. off the catalogue list in addition to 50 per cent. if he bought goods to the value of £25 or more. He put it on the order so there should be no misunderstanding. The plaintiff's representative said that they had given the defendant 50 per cent. discount, and their point was their traveller had agreed to give another 5 per cent. if the money was paid within a reasonable time, and that in their view the defendant had not made his payments within a reasonable time. Judge Rentoul, K.C., said in the absence of the traveller he must accept the defendant's description of the transaction. The plaintiff, like all other suppliers of electrical accessories, issued a catalogue charging 100 per cent. more than he was willing to take for the goods. That was done for the benefit of the innocent, but with traders like the defendant they knew they could get 50 per cent. off. It was a business matter. It was very similar in the piano trade, where people could tell their friends that they had bought an instrument listed at 100 guineas when they had in fact paid £45 for it. He went through the accounts, and in the end gave judgment for the plaintiff for 9s. 7d. and costs. The defendant subsequently returned and asked for his costs, but was informed he would have to pay the plaintiff's costs instead of receiving any for himself.

Power House Accident.—Railway Co. Fined.

At Formby, on March 3rd, the Lancs. and Yorkshire Railway Co. were summoned for a breach of the Factory and Workshops Act in connection with an accident which occurred at the Formby power house. Mr. Samuel Pope (instructed by the Mr. L. S. Holmes), appeared for the Director of Public Prosecutions, and Mr. Hyslop Maxwell (instructed by Mr. Parmiter), represented the company.

The accident, it was stated, occurred as the result of two men continuing to work at a live switchboard. According to regulations, they should have left the work until midnight, when the switchboard would be dead. They did the work on their own responsibility. When Hindley, one of the men, was on a step ladder, a cable he was carrying caught a live part of the plant. He was thrown from the ladder and severely burned. He was receiving hospital treatment, and the company were paying him compensation.

Mr. Maxwell pointed out that the company could have taken proceedings against Hindley for his action in working contrary to regulations, but they had preferred to take the responsibility for what he had done.

The Magistrate imposed a penalty of £20 and £20 costs.

Damages against West Ham Corporation.

Damages to the amount of £300 were awarded in the King's Bench Division, on Friday, before Mr. Justice Shearman and a common jury to Herbert Spicer, a baker's assistant of Leyton, against the West Ham Corporation. Last May he was driving his van along the Broadway, Stratford, when a wheel was wrenched off, it was alleged, owing to the defective condition of the tramway route. Plaintiff was thrown to the road and broke his arm, and it was said that the movement of the arm was permanently impaired. The Corporation denied the allegations on which the claimed was based.

Holbrook *v.* Ford.

In the City of London Court, on February 25th, before Mr. Registrar Wild, Messrs. J. Holbrook & Co., electricians, Foster Lane, E.C., sued Mr. Ford, shirtmaker, for 13s. 6d. for fitting up electric light at premises situate in Cheapside.

The plaintiffs' witness said that Mr. Ford made an application to them to fit the premises up with electric light. The work was carried out and no complaint was made. There were several applications for payment, and then Mr. Ford said he would let them have something on account. Later it was suggested to them that it was Mrs. Ford for whom the work had been done, and she had since been added to the proceedings. In January Mr. Ford came to them and told them he had nothing whatever to do with the business. That was the only evidence they had on that matter. The defendant, Mr. Ford, said he was instructed by Mrs. Ford to have the electric light put up. He (defendant) was only working as a porter for Mrs. Ford, and was getting no salary. Mrs. Ford had asked him as as favour to get the light put in. The Registrar said that the defendant went to the plaintiffs and did not say a word about Mrs. Ford being liable, but had himself given the plaintiffs the order for the work. What Mrs. Ford had said to him (defendant) was not conveyed to the plaintiffs. The defendant said what he had done was done on behalf of Mrs. Ford.

The Registrar said the defendant should have given the plaintiffs the opportunity of trusting Mrs. Ford. The defendant had made himself responsible for the work. There was no evidence in the case except what the defendant said about Mrs. Ford, and she would be struck out of the proceedings.

The Defendant said he had nothing to do with the matter.

The Registrar: You have everything to do with it. You have given the order for the work. You say you act as agent for Mrs. Ford, but inasmuch as you never mentioned it to the plaintiffs, you have made yourself responsible. It is no use your now saying the debt belongs to someone else.

Judgment was given for the plaintiffs, and an order made for payment in 14 days.

The Value of a Dog.

At the Manchester Assizes on February 26th, James Billington, travelling dealer, of Hilda Street, Moston, brought an action for damages against the Manchester Corporation, alleging that he received injuries while travelling on a city tramcar, through the driver pulling up the car suddenly. The driver of the car stated that he pulled up suddenly to avoid running over a dog. Damages of £100 were awarded to the plaintiff, and the jury expressed the hope that the driver would not suffer in any way. Mr. Justice Sankey expressed a similar hope, and counsel undertook to convey these expressions to his clients—the Corporation.

Ban on Electricity in Russian Churches.—The Eparchial Congress of Divines, having considered the principle and the practical aspect of allowing electric lighting in the churches in no case to be allowed in chandeliers, or before the sacred ikons (images), has proposed to lay a tax on the churches that use electricity, in favour of the Eparchial candle factory. The tax is to be 40 copecks (about 10d.) per lamp per year. The only lamps to be exempt from this tax are those illuminating vestibules. Cold churches, where services are only held in the summer time, will pay only half the tax.

WAR ITEMS.

American Electrical Exports.—The American "Electrical Review and Western Electrician" publishes the following particulars of the U.S. electrical exports for last December, and also for the calendar year 1914:—

The December total was slightly below that of the preceding month, and still much below that of the corresponding month in 1913. For the four classes for which the number of articles shipped is given in the Government reports, there were exported in December the following: Electric fans, 693; arc lamps, 52; carbon-filament lamps, 34,856; metal-filament lamps, 383,545.

Articles.	Dec. 1914.	Dec. 1913.
Batteries	$ 58,947	$ 45,928
Dynamos or generators ...	262,325	181,407
Fans	13,784	19,012
Insulated wire and cables ...	92,146	190,090
Interior wiring supplies, etc. (including fixtures)	54,836	52,125
Lamps—		
Arc	742	2,776
Carbon-filament	3,962	14,785
Metal-filament	64,058	21,267
Meters and other measuring instruments	21,200	—
Motors	271,192	376,122
Static transformers	62,097	134,213
Telegraph instruments (includ- wireless apparatus)	2,118	31,999
Telephones	113,627	159,030
All other	599,529	1,005,245
Total	$1,620,563	$2,233,999

The table of monthly totals for the year 1914 shows that early in the year already there was a decline month by month from the high totals of 1913, which became most marked, however, in August, the first month of the war:—

Months, 1914.	Electrical Exports.
January	$1,947,646
February	1,930,513
March	2,104,332
April	1,741,551
May	2,040,720
June	1,450,437
July	1,415,360
August	1,024,010
September	1,548,468
October	1,494,792
November	1,644,723
December	1,620,563

The annual totals for the years following 1908, when the last general export depression reached its lowest point, are:

Years.	Electrical Exports.
1908	$12,613,730
1909	13,027,550
1910	17,001,126
1911	19,355,536
1912	23,212,813
1913	28,197,363
1914	19,963,115

American Electrical Industry: Its Opportunity.—"In every industry the business leaders are realising that an emergency exists. Methods and policies are changing. The overworked word "efficiency" which rolled so smoothly from the tongues of many for several years, has come to have a new meaning. We all know that intensified production and efficiency in the shop and in the office have been, to a great degree, matters of a conversational character. To-day men are more than ever earnestly seeking better ways of doing business, and it is a part of every business man's creed that it is along the lines of intensified production and increased efficiency of operative movements that increased profits lie. Business men are planning ways and means to-day that either because of conservatism or fear would have received but scant consideration only a short time ago. The dearth of raw materials forced upon us by the European war, which has deprived us of easy and economical access to many things regarded as indispensable in the fabrication of many materials, has quickened the impulse of the American inventor and manufacturer, and new industries are springing up where it has heretofore been considered impossible to make a safe investment, to say nothing of gaining a decent livelihood. The necessity for quickly establishing new industrial relations and a better understanding of manufacturers in general of the economy and refinement of control of electrical energy, are attracting the brightest minds of aggressive manufacturers in every line of commercial activity to the use of electrical apparatus. . . . The present crisis is the opportunity of the electrical industry. As our factories become busier and busier there will be a greater demand for motor-driven apparatus, for other electrical appliances, and as the busy

plants work up to their normal capacity the greater will become the demand for controlled power. As the necessity for night work comes on the desirability of the use of electricity as a medium of illumination will become more and more apparent. Any material prosperity which may come to other industries means a tenfold increase in the prosperity of those having to do with the generation of electrical energy and the manufacture and distribution of industrial electrical appliances."—"Electrical Review and Western Electrician."

An Appeal for Belgian Refugees.—Seventy little Belgian orphan children whose home (the Cathedral Orphanage) in Malines was burnt to the ground by the Huns, arrived in England, via Holland, in charge of their matron and Canon de Weerdt, in a pitiable plight. A place of refuge was found for them at "Highfield," Hendon, near London. "Highfield" was formerly a high school for girls, but it is now the property of the International Correspondence Schools, who purchased it the month before the war as a site for new headquarters for the Schools. The military authorities accepted the I.C.S. offer of the premises for accommodating wounded soldiers, but the claim of the seventy little ones was more immediately pressing and the buildings were placed at the disposal of the Reverend Mother of La Sagesse Convent, which is near by, as a Home for Refugees, for twelve months at a rental of one shilling per annum, the upkeep of the grounds and the other incidental expenses of the estate being undertaken by the directors of the I.C.S. The story of how the necessary furniture was got together, how the continuous flight from Belgium brought heavy demands, increasing the number in the home to 175, including 90 orphans, how all of these have been and are being fed and clothed, and the children taught and trained, how supplies have run perilously short, and how urgent is the need for assistance in order that the merest necessaries may be provided—all these things and more are told in a pamphlet issued by the I.C.S. The claims of Belgium are common to all Englishmen, and we pass on the appeal of the Reverend Mother and the Sisters of the Convent, heartily commending it to the generosity of our readers. One way in which support may be given is by purchasing tickets for a special matinee of "A Country Girl" that Mr. George Edwardes has kindly consented to give at Daly's Theatre on Wednesday, March 24th, for the benefit of the Home. These may be obtained from Mr. Edgcumbe Brighten, at the I.C.S. Offices in Kingsway.

The Swiss Aluminium Co.—The Chairman of the Neuhausen Aluminium Industry Co. has now made a definite statement setting forth the purely Swiss character of this undertaking, whilst the shareholders have unanimously sanctioned an alteration in the company's statutes expressing the Swiss nature of the enterprise in a more definite form. Why such steps should be deemed necessary is explained by the fact that the French Government has placed under compulsory administration—sequestration according to the Chairman—the company's subsidiary in Marseilles, which bears the title of the Société Francaise pour l'Industrie de l'Aluminium. The Chairman, in the course of the declaration made at the recent annual meeting, emphasised that the undertaking is a purely Swiss company which was formed 26 years ago, and still remains under the same chairmanship and the same management, and by far the greatest number of the shares have been in Swiss ownership for many years past. The company has lodged a protest against the action taken by the French Government, and hopes, with the support of the Swiss Federal Council, to secure the removal of the sequestration of the French branch company. Colonel Huber, the chairman, is reported to have further stated that the rumours circulated that the company was a German undertaking emanated from former French partners and collaborators who wished to injure the enterprise on the pretext of patriotism. However that may be, we note from the reports published in the German newspapers of the company's meeting that an addition of three Swiss had been made to the board of directors, which now consists of nine Swiss and six—not Germans but "foreigners." If, then, no addition had been made to the board, the number of "foreigners" would have still been equal to the Swiss. It seems unfortunate that the number of native Swiss has not been in a majority for years past.

Japan and Australia.—"The Sydney Morning Herald" states that Japanese Trade Commissioners were in Australia in January with the object of forming a stronger bond of commerce between the two nations. The head of the delegation, Dr. J. Miura, who is secretary to the Department of Commerce of the Japanese Government, interviewed some of the directors and heads of departments of business firms. Dr. Miura intends to stay in Sydney for two months, after which he will visit Melbourne, Adelaide, Tasmania, and New Zealand. His object is to interview the officials of the various State and Commonwealth Governments. The other members of the delegation, Messrs. F. S. Nakagawa, N. Matumora, and K. Hishida, are all business men in a large way in their own country, and they are at present getting into touch with the heads of the big business houses in Sydney. Mr. Matumora stated that he intended to investigate conditions and find out what was wanted. His firm were large general importers and exporters. They would take in Japan almost anything that Australia could offer. Till recently they had been importing large quantities of machinery from England, but this was now obtainable only in limited quantities. The market in Japan was dull, and they were looking farther afield for trade. He saw great possibilities for a market in Australia for glassware, which they could produce in unlimited quantities in Japan.

Board of Trade Assistance.—In connection with the special arrangements which have been made in the Commercial Intelligence Branch of the Board of Trade for dealing with enquiries, a list of goods which firms in this country have intimated that they are prepared to suppy is now ready, and may be obtained on application to the Director of the Branch at 73, Basinghall Street, London, E.C. The Branch has also issued List No. 9 of articles which enquirers desire to purchase.

Electric Lighting Engineers.—A Cardiff paper says that on March 3rd the Second Reserve Electric Lighting Companies of the Glamorgan Fortress Engineers left Cardiff for Milford Haven. They numbered 61 and were under the command of Captain Courtis, the other officers being Lieut. E. P. Rees and Lieut. Price.

Bradford Electricity Employés' Wages.—The Electricity Committee of the Bradford Corporation recently passed a resolution advancing the wages of engineers in the employ of the department by 3s. per week and reducing their hours to eight per day.

Roll of Honour.—Private John Horrocks, who has died at Blackpool, where he was in training, was formerly employed by the Lancashire Dynamo and Motor Co., Trafford Park, and representatives of the firm attended the funeral last week.

Private Walter Haynes (19\ formerly in the employ of the Salford Tramways Department, has been killed in action.

On January 23rd, Private H. Dixon, of the 1st West Yorkshire Regiment, was fatally shot by a German sniper. He was a reservist, and prior to the war was employed as a conductor on the Leeds tramways.

BUSINESS NOTES.

Trade Announcements.—MESSRS. T. WAINWRIGHT AND SONS, LTD., electricians, have removed from 257 to 329, Lord Street, Southport, their old premises being required for demolition.

THE LONDON AND RUGBY ENGINEERING CO., LTD., have removed to 36 and 37, Queen Street, E.C., which will also be the London address of THE RUGBY LAMP CO., LTD., and MESSRS JAS. PROCTOR, LTD. Their telephone number "City 5252," and telegraphic address: "Cleodora, Cannon, London," remain unchanged.

Russia.—H.M. Consul-General at Moscow reports that a firm in that city wishes to purchase, from United Kingdom manufacturers, electrical fittings and appliances. The firm is a large concern. Further communications should be addressed to the British Consulate-General, Moscow.

Bankruptcy Proceedings.—ALBERT WHITELEY, electrical and mechanical engineer, Tudno Works, Tudno Street, Llandudno, Carnarvon.—The public examination of this debtor took place at the Magistrate's Room, Bangor, last week, when the statement of affairs showed an estimated deficiency of £310. The failure was due to want of capital, loss of money in former partnership and to the giving of long credit. The debtor stated that he commenced with borrowed capital, and had never been able to repay the loans. When in partnership he and his partner drew out about 25s. a week. He made more than that as a workman. There were now no remaining liabilities of the partnership. When he commenced to trade on his own account he had about £50 worth of stock and borrowed about £40. Altogether he borrowed about £150 from his mother, which was still unpaid. He had borrowed other sums. He sublet part of his workshop for £10 a year. It cost him £8 plus rates and taxes. He used to obtain a fair amount of contract work apart from cinema contract work. He had kept two men regularly, and had to pay their wages whether he had work or not. He borrowed some of the money to pay a specified creditor. He had no account to show what profit or loss he had made. He claimed a substantial balance of an account against a cinema company, and an independent engineer had been called in who had not yet given his report. His claim was for £142. Of late he had drawn £2 a week out of the business, which, however, could not really afford it. He had intended to offer a composition, but that idea fell through. The examination was closed, the Official Receiver remarking that the debtor had given every help in the elucidation of his affairs.

GEO. DRIVER & SON, electrical and mechanical engineers, Hythe Road, Willesden Junction, N.W.—Receiving order made March 5th on creditor's petition. First meeting, March 23rd; public examination, April 22nd, both at Carey Street, W.C.

For Sale.—Walthamstow U.D.C. have for disposal one 160-KW. and one 133-KW. vertical Westinghouse gas engines, direct coupled to 460-volt D.C. generators. Tenders by March 24th. Particulars are given in our advertisement pages to-day.

Catalogues and Lists.—Edison & Swan United Electric Light Co., Ltd., Ponder's End.—Two new cards—one a postal card and the other a folder. The former gives prices of Royal Ediswan drawn-wire lamps; the latter gives fuller information, prices and illustrations of the same lamps. Both bear in colour a new Ediswan pictorial design for war time, the object of which is to emphasise that the lamps give a strong and penetrating light, and, we suppose, will stand anything. A publicity novelty in the shape of a small blotter has also been received.

Jackson Electric Stove Co., Ltd., 38, Blandford Street, London, W.—Two price cards (Nos. 9 and 10) with illustrations and brief particulars of their electric grills and breakfast cooker respectively.

General Electric Co., Ltd., 67, Queen Victoria Street, E.C.—Leaflet No. H 1,858, illustrating and describing Magnet portable electric cookers, models A and B.

The St. Helens Cable and Rubber Co., Ltd., Warrington.—Booklet giving the actual experience of users of cab-tire sheathed cable, with other information. The uses referred to include the wiring of chemical works, outdoor cranes, collieries, dye works, galvanising tanks, ironworks, lavatories, soap works, stables, and many other difficult situations, such as motor-cars, lifts, &c.

The Edison and Swan United Electric Light Co, Ltd., 123-125, Queen Victoria Street, E.C.—Leaflet relating to Ozonair apparatus, to which a display has been organised at the above address, machines being shown suitable for a variety of domestic and business purposes.

Book Notices.—The February number of the *Journal* of the Tramways and Light Railways Association contains extracts (including table matter) from the Board of Trade return respecting the working of tramways, light railways and railless trolley systems for 1913-14; also interesting excerpts from the report of the London Traffic Branch of the Board of Trade.

Annuaire de l'Electricité. Paris: *La Lumière Electrique.* Price 4 fr.—This is the second edition of a very useful publication, containing a mass of information relating to the electrical industry in France. More than half the volume consists of a list of towns and villages which have a supply of electricity, with the name of the supply authority, particulars regarding the supply, and the tariff. Hamlets of a few hundred inhabitants are included, and we notice one of only 29.

Other sections deal with traction, electricity companies, public bodies and societies, legislation relating to electricity, educational institutions and *personnel*, the electrical Press, and electrical manufacturers. The work is very complete, and should prove useful to many who have business relations with our Ally.

The Relay Automatic Telephone Co., Ltd., of Marconi House, London, have issued a booklet describing the system devised by Messrs. Betulander and Palmgren, of which an account was given in the Electrical Review of July 10th, 1914; the method of operation of the numerous relays upon which the system wholly depends for its action is difficult to follow, but in this booklet excellent diagrams are given, showing the successive operations clearly, with explanatory letterpress, and illustrations of actual apparatus. The revolutionary character of this system, as compared with all previous automatic systems, and the importance of the new departure thus made, were emphasised in our pages at the time of its introduction.

Universal Electrical Directory (*J. A. Berly's*). 34th Annual Edition. London: H. Alabaster, Gatehouse & Co.

Trade with Canada.—In accordance with the practice that has been established for H.M. Trade Commissioners in the British Self Governing Dominions to visit the United Kingdom officially from time to time, so that manufacturers and merchants may have the opportunity of consulting them on any matters connected with their business, or of obtaining information as to the possibilities of extending their trade, it has been arranged that H.M. Trade Commissioner for Canada (Mr. C. Hamilton Wickes) shall shortly pay an official visit to this country. H.M. Trade Commissioner's visit is particularly opportune at the present time, when United Kingdom manufacturers are attempting to capture trade hitherto done by German firms in Canada, and it is anticipated that a very large number of firms will wish to take advantage of this opportunity to consult him. Among the matters in regard to which he is prepared to give information and advice are the appointment of agents, methods of marketing and distribution, terms of payment, names of probable buyers of British goods, statistics of imports, and rates of Customs duties, in Canada.

Mr. Hamilton Wickes will attend first at the offices of the Commercial Intelligence Branch of the Board of Trade in order to meet representatives of those firms who may be able to see him in London, and afterwards he will visit such trade and industrial centres in the provinces as it may appear most advantageous to visit in view of applications that may be received from firms in or near those centres, and from Chambers of Commerce.

In order that appointments may be satisfactorily arranged, firms who may desire to have an interview with Mr. Wickes are requested to make their applications as soon as possible. Such applications should be addressed to the Director, Commercial Intelligence Branch of the Board of Trade, 73 Basinghall Street, London, E.C. The reference number C.I.B. 10732/15 should be quoted.

British Trade with Nigeria.—Mr. C. A. Birtwistle, Commercial Intelligence Officer in Nigeria, the Correspondent of the Board of Trade for that Colony, who is now on a visit to England, will attend at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C., on Wednesday, Thursday and Friday, March 17th, 18th and 19th, between the hours of 10 a.m. and 5 p.m., and will be pleased to see, by appointment, British manufacturers and traders who may desire to consult him regarding trade conditions and openings in Nigeria. Applications for appointments with Mr. Birtwistle should be made promptly to the Director of the Commercial Intelligence Branch as above.

Exhibition.—Messrs. Ward & Goldstone are exhibiting a large range of their British-made electric pocket lamps, torches, cycle lamps, novelties, &c., at the Toy Fair and Market, which opens at the Agricultural Hall, Islington, on March 16th. Purchasers of these lines will be welcomed at Stand No. 74.

Dissolution.—Parker & Jubb, electrical engineers, King Street, Wakefield.—Messrs. P. Parker & S. Jubb have dissolved partnership. Mr. E. A. Fowlie, of 15, King Street, Wakefield, will attend to debts.

Exhibition Postponed.—The Shipping, Engineering and Machinery Exhibition, which was to have been held at Olympia last September, and was postponed on account of the war, is to be further postponed until August and September, 1917.

LIGHTING and POWER NOTES.

Australia.—The Taree (N.S.W.) Municipal Council proposes to establish an electricity undertaking in the town, and an inquiry was to be held into the question of borrowing money to finance the scheme.

The Campbelltown (N.S.W.) Municipal Council has decided to recommend the ratepayers to adopt electricity for street lighting, and has resolved to obtain expert advice with regard to the cost of the installation.

The Tenterfield (N.S.W.) Municipal Council proposes to borrow £6,200 for the purpose of establishing electricity works.

The Warwick (Queensland) Municipal Council has adopted the report of the Government hydraulic engineer on the Canning Downs water scheme; the energy for pumping purposes is to be obtained from the Warwick Electric Supply Co.—*Tenders.*

Bacup.—Public Lighting.—The T.C. is substituting electricity for gas lighting on the Todmorden Road.

Barnet.—Workhouse Lighting.—In view of further information, the B. of G. has decided to reconsider the question of producing its own current for lighting the workhouse, with a view to the supply being obtained from the North Metropolitan E.P.D. Co.

Batley.—Loan Sanction.—The L.G.B. has sanctioned the borrowing of £6,500 for electric cable extensions in the districts of Healey, Staincliffe, Carlinghow and Bradford Road West.

A Sub-Committee has been deputed to consider tenders for transformers and switchgear, and also to report as to the provision of sub-stations, &c., in connection with the proposed cable extensions.

Blackburn.—Restricted Lighting.—The order for reduced lighting which has now come into force, affects the public arc and tramway lighting, while outside shop lighting is prohibited.

Bexhill.—Coal Prices, &c.—The T.C. has decided to pay the contractors an additional 1s. 6d. per ton over the contract price for the supply of coal to the electricity works. The Electricity Committee has reduced the public lighting account by £51 for the three months ended December last owing to the restricted lighting. It was stated that instructions had been given for further reductions in the lighting of the streets.

Bradford.—The Electricity Committee has decided that, pending the settlement of the wages question between the Federated Employers and the Amalgamated Society, and commencing immediately, a 15 per cent. war bonus be paid to the mechanics, smiths, fitters and other workmen in the electricity department.

Electric Cooking.—An official inspection of the electric cooking installation at the Kursaal (Queen's Hall), by the members of the Council, took place on Tuesday evening.

The Lord Mayor occupied the chair at the dinner which followed, and which was cooked electrically.

In the course of the evening, Mr. R. S. Downe, on behalf of the Brompton and Kensington Accessories Co., Ltd., who supplied the installation, referred to the advantages of electric cooking, and to the up-to-date character of the Kursaal equipment, which is designed to provide a table de hôte dinner for 500 persons. In an ordinary middle-class house, he said, the cost of electric cooking would not exceed 1½d. per head per day, with energy at 1d. per unit. In the B. and K. electric restaurant the energy used did

not exceed ⅔ unit per head, and if they had 250 meals a day, he would guarantee that the energy for cooking would not exceed ½ unit per head. Amongst the apparatus installed are a central range fitted with Bain Marie and four ovens, a circular steamer, fish frier, grill and water urns. In the ground floor café a carving table and hot cupboard, tea urns, a toaster, cooker and hot-water geyser are provided, while further apparatus is fitted in the middle café. Electrically-heated towel-rails are provided in each of the cafés, these and a geyser for the wash-bowls having been supplied by the British Electric Heater Co., Glasgow.

The Corporation has appointed the Chairman of the Electricity Committee and the Town Clerk to represent it on a Joint Committee of representatives of West Riding County Boroughs, who have lodged petitions against the Yorkshire Electric Power Bill, to watch the interest of the combined authorities.

Burton-on-Trent.—Rate Relief.—A sum of £4,000 is to be appropriated from the electricity and gas departments in aid of the rates, subject to the approval of the Council.

Cahirciveen (Kerry).—E.L. Scheme.—A public meeting was held during last week to consider a proposal for the electric lighting of the town. Mr. E. L. Cantwell, of the Ampere Electrical Co., explained the scheme, and a Committee was formed to canvas the district.

Canada.—Amongst the contracts reported to have been placed in connection with the war is one for the supply of 300 electric heaters for use in the trenches.

Chertsey.—The Ascot District Gas and Electricity Co. has informed the R.D.C. that it has been decided to reduce the price for current in the whole district of Ascot to 6d. a unit, flat rate, for lighting purposes. The consumers in the Woking area would thus be entitled to the same terms.

Continental Notes.—Norway.—As previously reported, the order for the six generators and turbines for the new power station, Rjukan II, of the Norwegian Hydro-Electrical Co., was placed with the Allmana Svenska Elektriska A/B, and these are the largest hydro-electric sets in the world. The work of installation has now been going on for some time, and the first generator was recently run on trial. The result showed a maximum capacity of 18,900 KW.

Before the war there were rumours that the Norwegian A/S for Electrochemical Industry was carrying on negotiations with the Government for the purchase of energy from some large waterfalls at Hemnas, in Ranen, belonging to the State. Ranenfjord is situated about on the same latitude as the Polar Circle. Last year the company bought two large deposits of limestone in the neighbourhood, and negotiations for a third one have been completed, thus providing materials for the future manufacture of nitrates or kindred products. As the company occupies a strong financial position, it is not improbable that the district, in a few years' time, may be turned into an industrial centre like Rjukan. The available energy of this district is roughly estimated to amount to more than 200,000 H.P.; a portion of it will, no doubt, be reserved for the electrical smelting of iron ore, and for a projected electrical railway from Trondhjem to Bado, but there will still be sufficient left for the nitrate industry or the electrochemical industry.

A new company—the A/S Blaafjeldene—has been formed to acquire the water rights of the River Blaaelven, in the province of Sondhardland in Western Norway, which will produce 100 000 H P. The company has also bought a large area of ground at Indre-Motre, suitable for sites for the future electrical works and factories, and an application for the necessary concession has been submitted to the Government. The capital of the new company is £27,800, which, however, will be increased when the concession is in order.

The Faaberg Municipality, in the neighbourhood of the town of Lillehammer, has decided to take up a loan of £5,500 for the purpose of distributing electrical energy among the inhabitants.

At the well-known tourist centre of Balestrand, in Western Norway, an electrical station, deriving power from two small rivers in the neighbourhood, has been built.

The parish of Raade, near Fredrikstad, has decided to erect a sub-station to be supplied from the Kykkelsrud works—which supply Christiania—and to distribute energy in the neighbourhood.

The parish of Skaanevik has recently secured the water rights of the Lia River, in Motre, and will develop 5,000 H.P., which is sufficient to cover the requirements of the district.

The authorities of the Province of Akershus, to the north of Christiania, have purchased the large Renaafos, which is a waterfall capable of delivering 25,000 electrical H.P. The price was £55,000, and it was originally intended to develop the fall at once, but this may be deferred owing to financial difficulties. The province of Akershus has a population of 130,000, and some of the parishes have no supplies of energy as yet. The project is not connected with any large industrial enterprise, as the whole amount will be needed by the population at the rate of ⅛ H.P. per capita.

Cuba.—The following persons have been granted permission to install electric generating and lighting plant in Cuba:—Senores Maristany and Florez Estrada, at Campo Florido, Province of Havana; Senor Galvani, in the town of Antilla, Province of Oriente; Senores Pollo and Herrera, at Coliseo, Province of Matanzas; and Senor Cuesta, in Arroyos de Mantua, Province of Pinar del Rio.—*B. of T. Journal.*

Darlington.—Proposed Loan.—The T.C. has decided to make application to the L.G.B. for sanction to a loan of £13,000 to meet the expenditure for mains, services and transformers during the next three years.

In answer to the Corporation's representations, the L.G.B. has extended the period for the repayment of a loan of £9,500 for mains, services and transformers, from 15 to 25 years, and in respect of another loan of £1,690, half to be paid in ten years (the original period fixed), and the other half in 20 years.

Dover.—Railway Supply.—The T.C. has concluded an agreement with the South-Eastern and Chatham Railway Co. for a supply of current to the new Pier Station. The Council will supply up to 15,000 units a year at 4½d., and beyond that at 3½d. per unit.

Dublin.—The City Electricity Committee has agreed that no commission be paid to canvassers bringing in orders unless with a guarantee from consumers to use £5 worth of electricity annually for five years.

The Chairman of the Dublin (Electric) Tramways Co., replying to statements made at the last Corporation meeting as to the relative charges for electricity in Dublin and Cork, says the Cork Co. supply power to private users in some cases as low as ¾d. per unit, while the charge for tramway power is still lower—viz., '61 of a penny. The average price for light and power in Cork is 1·95d. per unit against a Dublin average of 2·99d.

Eastbourne.—New Turbine Plant.—The T.C. has adopted the recommendation of the Electricity Committee to purchase a 1,250-KW. Ljungstrom turbo-alternator, at a cost of £5,800.

Fleetwood.—School Lighting.—The Education Committee has decided to light a new school by electricity, and the U.D.C. is to be asked to extend its mains for the purpose.

Fowey.—E.L. Scheme.—The T.C. has referred to the Lighting Committee a communication from Mr. H. O. H. Wenman, of Wolverhampton, regarding an electricity scheme for the town. He offers to establish the works, and to supply electricity at 6d. per unit, the Council to have the option of purchase at the end of 14, 21 or 28 years.

Gillingham (Kent).—The T.C. has asked the Chatham T.C. to consent to Gillingham laying E.L. mains in the borough of Chatham, such consent to cover future cases, on the understanding that as soon as the mains for the Kent E.P. Co. are laid in the locality, the Council will cease to supply current. The Chatham Council recently refused a similar request.

Glasgow.—Gas Firing.—A Joint Committee of the Electricity and Gas Committees has under consideration the question of providing appliances for the gas firing of boilers at the generating stations, and the extraction of the tar, &c., from the coal carbonised. It has been decided to arrange for a joint experiment with the Maclaurin process, as the same type of apparatus used in that process is also used for the production of smokeless fuel. The electricity department is in a position to use the gas during experiments for firing the boilers at the generating stations where the plant will be installed.

Grimsby.—The T.C. last week, by 17 votes to 16, decided to postpone the new battery scheme for six months.

Heywood.—L.G.B. Inquiry.—An inquiry was held on March 5th respecting the application of the Corporation for permission to borrow £12,460 in connection with the arrangement whereby a bulk supply of electricity is to be taken from the Bury Corporation. The inspector announced that the L.G.B. was acting in conjunction with the Treasury, and that no borrowing powers would be sanctioned during the war except under extraordinary circumstances and for work required to be done to execute Government contracts. Everything that was proposed to be done would have to be shown to be absolutely necessary. The electrical engineer stated that several local firms were executing Government contracts and had applied for electricity for power purposes.

India.—On February 1st, the Commissioner in Sind opened the central generating station of the Karachi Electric Supply Corporation at Karachi.

Kingstown.—E.L. Scheme.—The U.D.C. has received application for immediate payment of £3,067, the amount of the arbitrator's award in connection with the promotion of the electric light scheme.

It is estimated that the cost of the transfer of the undertaking will be about £5,000; the Electric Lighting Committee recommends that the Council should now formulate an electric lighting scheme, and apply to the L.G.B. for the necessary loan.

Leeds.—L.G.B. Inquiry.—On Friday last an inquiry was made into the application of the Corporation for power to borrow £25,000 for further electrical plant.

At a meeting of the City Council last week the question was raised of the permission which had been given to the Yorks Electric Power Co. to supply electricity in various parts of Rodley; it was pointed out that if the Corporation ultimately found itself in a position to provide the supply, the company would be bound to withdraw.

Llandudno. — Proposed Loan. — The U.D.C. has applied for a loan of £1,720 for additional plant, &c., at the electricity works.

London.—L.C.C. Loans.—The Treasury has intimated that it is undesirable to incur capital expenditure at the present time, and has asked that applications for sanction to loans of £28,000, including £5,000 for Battersea B.C. and £10,000 for Hammersmith B.C., both for electricity purposes, should be reconsidered. Pending a definite statement from the Treasury, the Council is withholding advances to local authorities, and is postponing the completion of loans already agreed to.

Hackney.—The Electricity Committee reports as to the negociations with the trustees of Messrs. Allen & Co. in the action, Allen & Co. *v.* the B.C., and recommends as a basis of settlement that the Council make payment to the trustees of £1,090 and £350, the latter sum being in lieu of returning the plant taken over by the Council; also payment of 17 guineas on insurances paid by the trustees.

The Special Committee of the B.C. appointed to consider the subject of the accountancy at the electricity department recommends that no alteration be made in the present system of dealing with the accounts of the undertaking, but that the annual stock-taking be carried out by independent stock takers in future, and that professional accountants having experience in the audit of electricity accounts be employed each year to conduct a commercial audit of the accounts of the electricity department, independently of the L.G.B. auditor.

London Electricity Supply.—The Special Committee of the L.C.C. reports that it has had under consideration the situation created by the fact that the proposed Bill will not be proceeded with in the present session, with a view to deciding whether or not it would submit any further proposals to the Council in the matter.

Fulham.—As owing to abnormally low tides difficulty has been experienced at the electricity works in obtaining sufficient water for condensing purposes, a survey is to be made of the river bed near the works.

Loughborough.—Electric Heating and Cooking.—The T.C. has discussed at some length a report by the electrical engineer on the subject of electric heating and cooking supply, and has adopted a tariff of 12½ per cent. on the rateable value of the house, plus ¾d. per unit. In opposing this decision, the chairman of the Gas Committee suggested that it was a plot to get hold of the gas heating and cooking, intimating that there were 4,000 gas stoves in the town, representing £15,000, and he could not think the Council would be so foolish as to throw that amount away. Nevertheless the Council, as reported, decided to be "foolish," and give electricity consumers the opportunity of adopting electric heating and cooking.

Manchester. — Barton Scheme. — Owing to the Treasury withholding sanction to the raising of new capital, the carrying out of the Barton extension scheme will be delayed. It is understood that the Committee will endeavour to commence the work in the coming year.

Middleton.—Public Lighting.—A scheme has been approved for lighting Long Street and Rochdale Road by means of 14 half-watt lamps.

New Zealand.—The lighting returns of the Wellington City electricity department shows that for the nine months ended December 31st last 297,834 more units were sold than in the corresponding period of 1913.

The scheme of the Dominion Portland Cement Co. to obtain power from the Wairua Falls, for a modern cement mill at Tikorangi, on the south shore of the Whangarei Harbour, is making rapid progress, and the mill is expected to be working in September next, with an initial annual output of 60,000 tons; the whole project involves a capital expenditure of £200 000.

The contract for the pipe lines and turbines has been placed with Messrs. Boving & Co., the erection of these on the site will be carried out by Messrs. G. Fraser & Sons; two 1,500-H.P. generating sets are being installed, but the station is planned for four such units. The transmission will be worked at a pressure of 22 000 volts.

The transmission line from the river to the company's works has been completed, and a branch line from the works to Whangarei is expected to be completed this month, making a length of transmission line of 22 miles. The Whangarei Council is starting its electricity scheme, and the lighting of the town is expected to be complete in May.

Nuneaton.—The T.C. has decided to carry out a modified scheme for the supply of current to the Stockingford district, at a cost of £1,750, for mains. The scheme will, for the first few years, entail a loss of £140 a year, but it is estimated that after three years' working the extension will show a profit.

Pembroke (Co. Dublin).—The Council has decided, in view of the increase in capital and other charges, and the prospect of a further rise in the price of coal, to make a 5 per cent. temporary increase on electric light accounts for 1915-16.

Sheffield.—Mr. W. J. Howard, mains engineer in the electric supply department, has devised a special system of power transformer protection. It has been adopted by a firm of electrical switchgear manufacturers on royalty, and 40 of these protective devices have been installed on the Corporation apparatus, resulting in a saving of capital expenditure.

The Corporation has been recommended to petition against the Yorkshire Electric Power Bill. The L.G.B. has decided to issue the prov. order applied for by the City Council to amend the "Sheffield Electric Lighting (Transfer) Act, so as to enable the Corporation to erect shops in connection with the proposed new offices in Bow Street. The Electric Supply Committee proposes to extend mains in various parts of the city, at a cost of approximately £4,950.

Shipley.—Textile Driving.—The U.D.C. has concluded an agreement with Messrs. Frank Hartley & Co., woolcombers, to supply current for an electric drive throughout their works. The firm will be the Council's largest power consumers.

Skelton and Brotton.—The U.D.C. has decided that in cases where installations for the E.L. are provided by firms on the instalment system, the instalments due shall be collected by the Council's collector when calling for payments due to the Council.

St. Anne's.—Public Lighting.—The chairman of the Electricity and Lighting Committee and the electrical engineer are to prepare a report upon the lighting of the Ashton Gardens.

In a report submitted to the U.D.C. this week, it was stated that the consumption of electricity for heating purposes showed a steady increase under the stimulus of the reduced price and more efficient heaters. The increased consumption for industrial purposes is also regarded as satisfactory in view of the limitations to that demand in the resort.

Stafford.—A Special Committee, which has had the matter under consideration, has been unable to make any recommendation as to constituting separate Committees for gas and electricity. The Council has asked for a further report.

Wimbledon.—The Electric Lighting Committee has decided to hire out electrical irons at a charge of 1s. per quarter.

Walsall.—It is proposed to adopt revised scales of charges for energy for power purposes; for D.C. or low-pressure A.C. the price will vary from 1½d. per unit for under 500 units per quarter to 1⅜d., with discount, for over 3,750 units. For bulk supply to factories the price will range downwards per KW. per quarter from £1 10s for over 20 KW. demand, plus ·35d. per unit. Special bulk supplies of alternating current will be given at prices ranging from 1·1d. to ·55d. per unit based on consumption and load factor. For electric vehicles, 1½d. per unit will be charged off peak, minimum 2s. 6d. per charge. The B. of T. has sanctioned the alteration of the system of supply from D.C. to A.C.

Waterloo.—Linking-up Proposal.—The Liverpool District Lighting Co., Ltd., is applying to the B. of T. for sanction to make a connection between its cables and those of the Bootle T.C. at the boundary at Seaforth, in order to provide a duplicate supply in case of emergency, and has asked for the U.D.C.'s consent. The Council has referred the matter to a Committee, with power to act.

Wolverhampton.—The Corporation Electricity Committee has decided that the sum of £2,215 in aid of the improvement rate be included in the Finance Committee's estimates for the ensuing financial year.

TRAMWAY and RAILWAY NOTES.

Bradford.—The Tramways Committee has instructed the general manager to pay full wages to any Bradford tramway employés discharged from the Navy or Army owing to disablement received on active service, until such time as the question shall have been dealt with on general principles applicable to the entire Corporation services.

The new railless trolley route from Forster Square (City), to Bolton Woods, *viâ* Canal Road, is now completed and awaiting Board of Trade inspection.

Road Maintenance.—The Joint Street, Drainage and Works and Tramways Sub-Committee has recommended that some annual contribution, on a basis to be determined later, be made by the Tramways Committee to the funds of the Street, Drainage and Works Committee, without prejudice to the position of either of the Committees concerned, in respect of the extra expenditure found to be necessary for the maintenance of roads on railless trolley vehicle routes in the city.

Bury (Lancs.).—At the T.C. meeting last week it was stated that owing to the war the receipts of the Corporation tramways showed a falling off of £150 a week, and the allowance to members of the staff who had joined the Army or Navy was £30 a week, which might be increased at a later date. These two items alone would take nearly £10,000 per annum, so that while the war continued the tramway undertaking would have as much as it could do to make both ends meet.

Doncaster.—The T.C. has sanctioned an expenditure of £5,300 on additional tramcars, and £1,800 on enlargement of tram sheds.

Glasgow.—A Special Committee of the T.C., consisting of the conveners and sub-conveners of all standing Committees, has been appointed to consider an application for an advance of wages by sections of employés in every Department of the Corporation's activities. In the tramway department the application is on behalf of all workers, excepting motormen and conductors, tradesmen at Coplawhill car works, set dressers, paviors, timekeepers, ticket inspectors, controller men at respective car depôts, and foremen and clerks at head office; and in the electricity department, all employés excepting bricklayers, masons, foremen and meter inspectors.

Leeds.—Third-Party Insurance.—The City Council has signified its approval of a suggestion that the Corporation should itself undertake the risks in connection with third-party insurance in regard to the tramway undertaking. During the last three years the cost of the third-party insurance through insurance companies has cost over 1s. per 100 miles as compared with the former payment of 6d. for the same distance. If the Corporation took the risk itself it would be able to save at least £3,000 per annum.

The Watch Committee has decided to purchase tokens from the Tramways Committee to be supplied to the special constables of the city in order that they may use the cars to convey them to and from points of duty without payment.

Tramway Extensions.—The tramway department has completed the extension of the Guiseley line to the White Cross Hotel, near Menston, an addition of nearly a mile, and also the new depôt at the end of the line. Good progress is being made with the installation of the railless traction system into Wharfedale, and it is expected that cars will be running to Otley and Burley by May or June.

Leicester.—Year's Working.—According to the statement of accounts of the tramway undertaking (including electric supply by direct current for power purposes) for the year ended December 31st last, the receipts (including interest on reserve fund investments) in excess of working expenses, and the cost of repairs and maintenance, amounted to £53,288. The interest and sinking fund charges, income-tax, bank interest, and allowances to employés on service in H.M. Forces amounted to £42,066, and sums amounting to £10,741 have been applied for various purposes, leaving a net balance of £479 to be carried to the district fund. The receipts in excess of working expenses and the cost of repairs and maintenance of the Aylestone electric lighting undertaking for the same year amounted to £22,712. After payment of interest and sinking fund charges there remains a net surplus of £7,643, which it is recommended should be carried to the district fund in relief of rates.

London.—The Highways Committee of the L.C.C. reports that the total safe working overload capacity of the plant at the Greenwich generating station, excluding No. 2 reciprocating engine, which will shortly be dismantled, is 39,000 KW., and with the 3,500 KW. additional supply about to be obtained from the London Electric Supply Corporation, the total capacity is 42,500 K.W. The present load on the station plant is 32,000 KW., so that the capacity of the spare plant will amount to 10,500 KW. The Committee recommends that, in order that more spare plant may be available and additional cars may be run, a further reserve supply of about 4,000 KW. be obtained from an outside source. The cost is estimated at £11,800 for cables, ducts, &c.

Musselburgh.—Strike.—Much inconvenience was caused last week by a strike of the drivers and conductors of the Musselburgh District Electric Tramway Co.

Sheffield.—In addition to the £2,000 paid annually into the tramway special purposes fund, the Tramways Committee of the Corporation has resolved to pay an additional £600 for the years ending March, 1915 and 1916, out of the tramway accumulated surplus fund.

Swinton.—The Swinton branch of the Amalgamated Association of Tramway and Vehicle Workers has decided to apply for an increase of 15 per cent. in wages on account of the higher cost of food. There are about 200 members in the branch, all of whom are employed by the South Lancs. Tramway Co.

Walsall.—Year's Working.—The accounts of the tramway undertaking for the year ended December 31st last show a profit of £2,478, after deducting £368 in respect of the final instalment of cost of alterations and extensions at the Birchills depôt; £271 in respect of balance of cost of alterations and extensions at tramway offices on the bridge, and £1,000 in respect of contribution in aid of rates of 1914. Working expenses during the 12 months amounted to £21,821, or 7·267d. per car-mile (as against 7·209d. in the previous year), made up of £8,509 in respect of traffic expenses; £5,670 for power expenses; £4,314 for general repairs and maintenance, and £3,328 for general expenses. Traffic revenue brought in during the year £33,310, or 11·094d. per car-mile (as against 11·007d. in the previous 12 months), which, with sundry other items, brings the total revenue up to £34,089. The Council is recommended to appropriate the net profit as follows:—£2,000 in aid of the rates, and £478 towards the cost of the siding in St. Paul's Street and Darwall Street.

Wolverhampton.—Rate Relief.—The Tramways Committee has allocated £4,018 to the borough rate from the profits of the tramway undertaking in respect of the financial year ending March 31st next.

TELEGRAPH and TELEPHONE NOTES.

Accrington.—The automatic telephone system installed at Accrington was expected to come into operation last week-end. The work has been carried out by the Automatic Telephone Manufacturing Co., of Liverpool, who have recently completed automatic exchanges in several places abroad, and have in progress similar equipments for Leeds, Portsmouth, Blackburn, Paisley, Newport, and Chepstow.

Cable Rates Reduced.—The Pacific Cable Board announces that the telegraphic rates to and from New Zealand will be reduced as from April 1st next. The ordinary rate, now 3s. per word, is reduced to 2s. 8d. per word, and the deferred ordinary rate, now 1s. 6d. per word, to 1s. 4d. per word. The "Week-end" rate, now 15s. for 20 words and 9d. for each additional word, is reduced to 13s. 4d. for 20 words and 8d. for each additional word. There are also reductions in the rates to Suva (Fiji) and Norfolk Island, and in the rates between Canada and New Zealand.

China.—The coast wireless telegraph stations at Woosung and Canton, completed for working last summer, have now started regular service; similar stations at Foochow and Hankow are expected to be completed within the next few months. The stations are all of the same construction, each being provided with two masts of a height of 200 ft., giving them a range of 700 nautical miles by day and at least 1,300 nautical miles at night.

Guernsey.—The balance-sheet of the Guernsey States Telephone Department for 1914 shows a total revenue of £7,530, and an expenditure of £6,761, including £2,066 depreciation and sinking fund payments, and £876 for interest on capital; the net profit for the year was £769. The total capital outlay on construction account was £49,154, provided by a loan of £32,000 raised in 1905 (of which £3,251 has been repaid), and £17,154 taken from the reserve funds, which, including this amount, stand at £21,944. The number of subscribers' lines at the end of 1914 was 1,772, and the total of all kinds 2,162, with a mileage of 1,508 miles of overhead line and 1,050 miles underground, showing increases of 62 and 235 miles respectively. The number of calls in the year was 1,571,721, an increase of over 200,000. The net profit in 1913 was £763.

Hull.—The City Council has instructed the Telephones Committee to make a thorough investigation with regard to the unsatisfactory working of the telephone system, which, in Hull, is the property of the Council. It was alleged that the tariff had been greatly increased, and that the service was most inefficient; in defence the inefficiency complained of was ascribed to the loss of a large number of skilled men through the outbreak of war, and to stormy weather.

Telephone Tariffs.—It is reported that in present circumstances the Government has decided to postpone the introduction of revised telephone rates.

Wireless Control Ship.—According to the *Journal Télégraphique*, the United States Government has equipped a vessel with apparatus for quickly measuring wave-lengths; it will cruise in the Atlantic and will ascertain whether wireless stations conform to the rules relating to the wave-lengths that they must use. It has been noticed during the past year that the regulations are often neglected. The control ship will also take steps to prevent the emission of alarm signals in cases that are not urgent, as has often happened.

Wireless on Aeroplanes.—It is reported from the front that a number of our aeroplanes carry wireless apparatus with which they are capable of signalling to their headquarters, and that it has been found possible, as the result of a wireless signal from the air, for the artillery to locate and hit a moving object before it could reach shelter.

CONTRACTS OPEN and CLOSED.

OPEN.

Aberdeenshire.—Tenders wanted for electric light work at new parish church, to be erected at Cults, Aberdeenshire.—A. M. Mackenzie & Son, Architects, 313, Union Street, Aberdeen.

Australia.—Melbourne.—March 16th. White Wheatstone receiving tape, for Postmaster-General. See "Official Notices" February 5th.

Sydney.—March 23rd. One 150-ton electric revolving floating crane for Naval Dockyard, Sydney. Particulars may be seen at the Board of Trade Commercial Intelligence Branch in London, and a cabled price will be admissible.

Balls Bridge (Dublin). March 15th. U.D.C. Twelve months' supply of electrical stores. Specification from the Town Hall.

Belfast.—March 15th. Twelve months' supply of stores for the Tramways and Electricity Committees. See "Official Notices" February 19th.

Burnley.—March 22nd. Electricians' work for the B. of G. Forms, &c., from Mr. J. S. Horn, Clerk, Union Offices.

Carlisle.—March 31st. Corporation. Twelve months' supply of jointing materials, oils and general stores. Forms, &c. from City Electrical Engineer, Victoria Viaduct.

Darlington. — March 18th. Corporation. Twelve months' supply of (10,000 tons) small, rough small, or single nut steam coal. Forms, &c., from Electricity Works, Haughton Road.

Dundalk. — March 23rd. U.D.C. Twelve months' supply of stores for the Electricity Department. See "Official Notices" March 5th.

Halifax. — March 26th. Electrical fittings for six months, for the B. of G. Mr. A. T. Longbotham, Clerk, 4, Carleton Street.

Hounslow.—March 15th. Electric light fittings and telephone maintenance at isolation hospitals, Mogden and Dockwell, for Richmond, Heston and Isleworth Joint Isolation Hospital Committee. Mr. F. C. Greville-Smith, Clerk, 213, High Street, Hounslow.

Hove. — March 26th. Corporation. One 500-KW. mixed-pressure steam turbine, complete with D.C. 230/285-volt generator and surface condensing plant; also a battery of 115 accumulators. See "Official Notices" March 5th.

Hull.—March 20th. Corporation. Six or 12 months' supply of coal for the Tramways Committee. Forms, &c., City Engineer's office.

Kirkcaldy.—March 22nd. Corporation. Twelve months' supply of brass castings, pitch, iron castings, &c., for the Electricity and Tramways Committee. Forms of tender from Mr. O. F. Francis, Burgh Electrical Engineer.

Liverpool.—March 12th. Electrical fittings for a year for the Select Vestry.

London.—L.C.C.—March 16th. Reconstruction of three miles of single-line tramway on the underground conduit system. Specifications, &c. (£5), from Chief Engineer, County Hall, Spring Gardens, S.W.

The Highways Committee recommends that tenders be invited from selected firms for the provision and laying of additional cables, in connection with the Council's tramways.

HORNSEY.—March 16th. Meters, cables and stores, &c., for the T.C. See "Official Notices" February 19th.

WANDSWORTH.—March 15th. B. of G. One month's supply of electrical fittings, for the Wandsworth Union. Forms of tender from the Clerk, Union Offices, St. John's Hill, S.W.

Londonderry. — March 13th. Corporation. Engine-room stores, carbons, meters, bitumen, fuse-boxes.

New Zealand.—WELLINGTON.—April 30th. Supply of a three-unit exciter set, and 1,600-KW. generator for the Lake Coleridge Hydro-electric scheme. Specifications from the Public Works Office, Wellington.

Rugby.—March 15th. 10,000 tons of peas, beans, D/S nuts, for the directors of the British Thomson-Houston Co., Ltd. Particulars from Mr. W. J. Terry, Supervisor of Purchases.

South Shields.—March 12th. Twelve months' supply of engine-room stores for the electricity works.

Spain. — March 27th. Spanish Post and Telegraph authorities, Madrid. Concession for the establishment and working for a period of 20 years of a telephone exchange in the town of Guardiola (province of Barcelona).

The municipal authorities of Zwigena (province of Almeira) have recently invited tenders for the concession for the electric lighting of the town during a period of 20 years.

Swindon.—March 13th. Corporation. Twelve or six months' stores for Electricity and Tramway Departments. See "Official Notices" February 19th.

Swinton and Pendlebury.—March 19th. U.D.C. Cables, joint-boxes, bitumen and joint-box compound. See "Official Notices" March 5th.

Transvaal. — BETHAL. March 25th. Municipality. Supply and erection of generating and pumping plant and overhead electric distribution system. Specifications from the consulting engineer, Mr. H. Hancock. P.O. Box 62, Klerksdorp (deposit £1 1s.).

Walthamstow.—March 24th. U.D.C. E.H.T. and L.T. switchgear and cables. See "Official Notices" to-day.

Warrington.—March 16th. Motor, cables, and E.H.T. feeder panel, for the Electricity Department. See "Official Notices" March 5th.

Wigan.—March 16th. Corporation. Supply of stores for the Electric Light Department. See "Official Notices" March 5th.

Wrexham.—March 17th. Meters, oils, coal, &c., for the Corporation Electricity Department, for a year. Borough Electrical Engineer, Willow Road.

CLOSED.

Australia.—The following contracts have been placed:—

Perth (W.A.) Municipal Council.—
Switchgear (to replace the A.E.G. switchgear).—British Westinghouse Electric & Mfg. Co., Ltd., £7,250.

Melbourne City Council.—
7,230 yards of single conductor lead-covered cables.—Glover & Co., £2,319.

Victorian Railways Department.—
25 battery signal machines.—Aust. General Electric Co., £925.

P.M.G.'s Department, Queensland.—
8,750 Siemens Obach dry cells.—Siemens Bros. Dynamo Works, £954.
—*Tenders.*

Bacup.—The Electricity Committee has accepted the tender of Mr. G. L. Adamson, Rochdale, for wiring and fitting the Market Hall, shops in Lordship Street, municipal offices, Sanitary Inspector's offices, public conveniences and fire station; and that of Messrs. Macintosh & Co., Ltd., for rubber cables.

Bridlington.—The T.C. has accepted the tender of Mr. George Robinson for electrical work on the New Spa.

Burton-on-Trent.—The tenders of Mr. R. B. Barratt for 5,000 tons of fine slack, and of Messrs. Marriott & Co. for 1,000 tons, have been accepted by the T.C. Electricity Committee.

Bury (Lancs.). — The Borough Insurance Committee has accepted the tender of Mr. John Jardin, Bury, for installing the electric light at their premises.

The Electricity Committee has accepted the tender of the Bolton Stone and Concrete Co. for the construction of a reinforced concrete retaining wall at the Chamber Hall power station.

Colchester.—The tender of Messrs. Siemens Bros. Dynamo Works, Ltd., for carbon and metal-filament lamps for the Corporation tramways for 12 months, has been accepted.

Darlington.—The T.C. has accepted the tender of Messrs. Fraser & Chalmers, of Erith, for a 3,000-KW. turbine and Siemens alternator.

Dartford. — The U.D.C. has accepted the following tenders for coal for the electricity works:—

John Hudson & Co., Ltd.—178 tons of South Hetton, £1 8s. 8d. per ton.
E. J. & W. Goldsmith, Ltd.—200 tons of Rubbly Culm, 15s. 4d. per ton.
Bradbury, Son & Co., Ltd.—120 tons of 1½-in. Nailstone, £1 per ton, and 300 tons of 1½-in. nutty slack, £1 1s. per ton.

Elland.—The U.D.C. has accepted the tender of Mr. Newsome, for 1,000 tons of Hodroyd engine nut coal for the electricity works, at 12s. 10d. per ton.

Gloucester. — The T.C. has accepted the following tenders for coal for the electricity works from March 15th to August 15th:—

Park Colliery Co.—1,000 tons of rough small steam, 15s. 10d. per ton.
Mr. E. Jarrett.—500 tons of No. 2 High Delf, 15s. 3d. per ton, and 300 tons of Yorkley steam, 15s. 6d. per ton.

Llandudno.—The U.D.C. has accepted the tender of Messrs. Browett, Lindley & Co. for an engine for the electricity works, at £780; and that of the Electric Construction Co., Ltd., for a dynamo, at £425.

Liverpool.—The following tenders have been accepted for annual supplies to the Electricity Supply Department:—

Metal-filament lamps.—Pope's Electric Lamp Co., Ltd.
Carbon-filament lamps.—Edison & Swan Co.
Cast-iron troughs and boxes.—E. Wilson & Co.
Brass and copper castings.—Gallie Bros.
Insulated cables and wires.—Liverpool Electric Cable Co., Ltd., and St. Helens Cable and Rubber Co., Ltd.
Stoneware troughing, insulators, &c.—O. Cooban; J. E. Beard & Co., Ltd; Callender's Cable Co., Ltd.; J. Bourne & Son; Liverpool Building Material and Cement Co., Ltd.

The following have been accepted for annual supplies to the Tramways Department:—

Tramcar motor equipments.—Dick, Kerr & Co., Ltd.
Steel gears and pinions.—British Hele-Shaw Patent Clutch Co., Ltd.
Iron castings.—Miller & Co., Ltd.; Moston Malleable Castings Co., Ltd.; and E. Wilson & Co.
Rubber goods, &c.—L. Andrew & Co.; Avon India-rubber Co., Ltd.; Hellewell & Co.; North British Rubber Co., Ltd.; New Liverpool Rubber Co., Ltd.
Oils, paints, &c.—Anglo-American Oil Co., Ltd.; Atlas Lubricating Co., Ltd.; Baxendale & Co., Ltd.; Bowring Petroleum Co., Ltd.; British Petroleum Co., Ltd; John Matthews & Co.; R. R. Minton & Co., Ltd.; Motor Benzole Co., Ltd.; Price's Co., Ltd.; Joshua Rea & Sons, Ltd.; W. H. Samuel & Co.; Siddall & Co.; J. & J. Taylor & Co.; W. R. Taylor & Co., Ltd.; Taylor's Automatic Disinfector, Ltd.; United Alkali Co., Ltd.; Wilkinson, Heywood & Clark, Ltd.; and Wm. Wright & Sons, Ltd.
Varnishes and special paints.—Lewis Berger & Sons, Ltd.; Meredith and Co.; Naylor Bros. (London), Ltd.; Sanitary Paint Co., Ltd.; and Wilkinson, Heywood & Clark, Ltd.
Lubricating oils and greases.—Vacuum Oil Co., Ltd.; Matthew Wells and Co., Ltd.

The following have been accepted for annual supplies to the Lighting Department:—

Wrought iron lamp standards, brackets, &c.—A. B. Dalzell & Co.; Ashmore and Co.; Killick & Cochran.
Cast-iron lamp columns and plugs.—Killick & Cochran.

Messrs. Stewarts & Lloyds, Ltd., are to supply steel steam-pipes for connecting the boilers at No. 2 station, Lister Drive, with those installed at No. 1 station.

London. — WOOLWICH. — The following tenders have been accepted by the B.C. Electricity Committee:—

Ferguson, Pallin & Co.—Switchboard extension, £62.
Babcock & Wilcox, Ltd.—Two steam boilers with chain-grate stokers (duplicate of present installation), £7,126.
G. & J. Weir, Ltd.—Feed pump, £195.

HACKNEY.—The Electricity Committee has received the following tenders for pipework and valves for the 5,000-KW. turbo-alternator:

J. Spencer, Ltd.	(recommended)	£1,060
Brightside Foundry & Eng. Co., Ltd.		1,997
Babcock & Wilcox, Ltd.		1,335

Meter Contracts.—The Llandaff and Dinas Powis R.D. Council and the Rhymney Valley and General Electric Supply Co. have both placed 12 months' contracts for single-phase meters with the Electrical Apparatus Co., Ltd.

West Ham Corporation has renewed its contract with Messrs. Venner & Co. for Chamberlain & Hookham A.C. meters for a further 12 months. Messrs. Chamberlain & Hookham, Ltd., have also received the Winchester contract for D.C. meters for the coming year.

New Zealand.—The Public Service Tender Board has accepted the following tenders :—

50 miles of twin-twisted insulated wire.—P. R. Baillie & Co , £582.
7,000 dry cells for telephones.—P. R. Baillie & Co., £271.
1,000 table telephones.—B. L. Donne, £2,488.
—*New Zealand Shipping and Commerce.*

Sheffield.—The Electric Supply Committee has resolved to accept the following tenders in connection with the extension of the Neepsend power house :—

Stirling Boiler Co., Ltd.—Water-tube boilers, mechanical stokers, superheaters, economisers, pipework and all accessories, £31,153.
George Longden & Son, Ltd.—Extensions to the engine room and boiler house, new switchrooms and stores, £21,799.
Thomas Smith & Sons.—50-ton overhead electric travelling crane, £2,102.
Gilbert Heathcote & Co.—Roof principals and supports, £3,658.

The Committee has also resolved to extend the contract of Messrs. A. Reyrolle & Co., Ltd., for E.H.T. switchgear at Neepsend, to provide the additional switchgear required in connection with the extensions of plant now in hand, at £5,311, based on the original contract prices ; also the contract with the same firm for the supply and delivery of E.H.T. sub-station switchgear to provide for 30 additional panels, at a total cost of £3,604, based on the schedule price in the original contract. The following tenders have been accepted by the Health Committee for supplies of electrical fittings :—

General Electric Co., Ltd. ; Tasker, Sons & Co. ; I.R , G.P. & Telegraph Works Co., Ltd. ; David Ashton & Co. ; Thomas A. Ashton, Ltd. ; C. Macintosh & Co., Ltd.

Southampton.—The Corporation has extended its present contract for A.C. meters with the British Thomson-Houston Co., Ltd., of Coventry, for another 12 months.

Stretford.—The U.D.C. has accepted the tender of the General Electric Co., at £79, to supply 500 yards of '2-sq. in. cable.

Torquay.—Owing to the difficulties and delays to navigation on the coast, the Town Council has agreed to pay an extra 2s. per ton over the original contract price for any future supplies of coal by Messrs. Renwick, Wilton & Co.

Tunbridge Wells.—The T.C. has accepted the tender of Messrs. T. Bates & Sons for the construction of a reservoir for the new cooling tower at the electricity works, at £547.

Walsall.—The T.C. has been recommended to accept the tender of Messrs. W. A. Stevens, Ltd., at £5 546, to supply four double-deck and two single-deck petrol-electric 'buses to the Tramways Department. The tender of Messrs. Woodall, Duckham & Co. is further recommended, at £19,845, for the construction of 20 vertical gas retorts with electrically-driven plant.

Watford.—The Electrical Engineer has been authorised to purchase 200 meters from the Electrical Apparatus Co., to be taken when required during a period of two years.

Windsor.—An offer by the Windsor Electrical Installation Co. to install duplicate pumps and motors, to be electrically driven, at the waterworks, for the sum of £1,100, and to take away the existing No. 5 Hayward-Tyler pump, allowing £100 for the same, has been accepted by the Windsor T.C. Each of the new pumps is to be of the Rees Roturbo pattern, with a capacity of 60,000 gallons per hour, to maintain a pressure equivalent to 200 ft. head. The company's estimate also includes the laying of necessary mains to connect with both Slough and Windsor power stations. For his advice and assistance the company's engineer (Mr. Farrow) has been thanked by the Corporation.

Wolverhampton.—The Corporation Tramways Committee has accepted the tender of the United Electric Car Co., Ltd., amounting to £818, for vestibules, staircases, &c., for 18 cars.

FORTHCOMING EVENTS.

Institute of Marine Engineers.—Friday, March 12th. At 8 p.m. At Tower Hill, Minories. Annual Meeting.

Physical Society of London.—Friday, March 12th. At 8 p.m. At Imperial College of Science, South Kensington. Papers on "The Estimation of High Temperatures by the Method of Colour Identity," and "The Unit of Candle-power in White Light," by Messrs. C. C. Paterson and B. P. Dudding ; and "The Relative Losses in Dielectrics in Equivalent Electric Fields, Steady and Alternating (R.M.S.)," by Mr. G. L. Addenbrooke.

South-Western Polytechnic Institute.—Friday, March 12th. At 8 p.m. At Manresa Road, Chelsea, S.W. Presentation of Prizes and Certificates.

Greenock Electrical Society.—Saturday, March 13th. Visit Messrs. Mavor and Coulson's Works, Glasgow.
Thursday, March 18th. At 7.45 p.m. At 21, West Stewart Street. Paper on "Suction Gas Plant," by Mr. E. P. Duckworth.

Royal Institution of Great Britain.—Saturdays, March 13th and 20th. At 3 p.m. At Albemarle Street, W. Lectures IV and V on "Recent Researches on Atoms and Ions," by Sir J. J. Thomson, F.R.S.

Institution of Post Office Electrical Engineers.—Monday, March 15th. At 6 p.m. At Institution of Electrical Engineers, Victoria Embankment, W.C. Paper on "Telephone Economics—Open Construction," by Mr. H. A. Smith.

Institution of Electrical Engineers (Birmingham Local Section).—Wednesday, March 17th. At 7.30 p.m. At the University, Edmund Street. Paper on "Electric Cooking, Mainly from the Consumer's Point of View," by Mr. W. R. Cooper.

Royal Society of Arts.—Wednesday, March 17th. At 8 p.m. At John Street, Adelphi, W.C. Paper on "The Industrial Uses of Coal Gas," by Mr. H. M. Thornton.

Institution of Mechanical Engineers.—Friday, March 19th. At 8 p.m. At Storey's Gate, S.W. General Meeting.

North-East Coast Institution of Engineers and Shipbuilders.—Friday, March 19th. At 7.30 p.m. At Bolbec Hall, Newcastle-upon-Tyne. General Meeting.

Association of Mining Electrical Engineers (West of Scotland Branch).—Friday, March 19th. At Royal Technical College, Glasgow. Paper on "The Use and Abuse of Oils in Connection with Electrical Plant," by Mr. T. C. Thomsen.

Electro-Harmonic Society.—Friday, March 19th. At Holborn Restaurant. Smoking Concert.

Association of Engineers-in-Charge.—Saturday, March 20th. At 7.30 p.m. At St. Bride's Institute, Bride Lane, E.C.

NOTES.

Electro-Harmonic Society.—The last smoking concert of the season will be held at the Holborn Restaurant (King's Hall), on Friday, March 19th, at 8 o'clock p.m., Sir John F. C. Snell presiding. The preliminary programme is as follows :—Tenor, Mr. Joseph Cheetham ; baritone, Mr. Tom Kinniburgh ; elocutionist, Mr. Ernest Meads ; humorist, Mr. Fred Curtis ; entertainer, Mr. Foden Williams ; entertainer at the piano, Mr. Finlay Dunn, and, by desire, a small professional orchestra from the London Symphony Players ; conductor, Mr. Charles Woodhouse (the King's Private Band). At the piano, Mr. Bernard Flanders, A.R.A.M.

Another Tramcar Ticket Case.—For refusing to produce a tramcar ticket, W. J. Crockett, of Kingston, was fined £1 and £2 5s. 6d. costs at Kingston, on March 3rd. The *Standard* says that he did it "for the public" because of the annoyance to which they were subjected, and he declared that he would carry the matter before the High Court.

Charge of Stealing.—At the West London Police Court last week, A. Pamington, electrical engineer, Newcastle Row, Clerkenwell, and T. Bamyard, sales manager, were remanded on bail on a charge of being concerned with Raoul de Redon (in custody) in stealing and feloniously receiving on February 16th certain X-ray tubes and apparatus, which were described to the Court as the property of the West London and Royal Free Hospitals.

Foreign Trade.—THE FEBRUARY FIGURES.—The following are the electrical and machinery figures given in the official returns for February :—

	Month of February.		*Inc. or dec.*	*Two months, 1915.*		*Inc. or dec.*
IMPORTS.	£		£	£		£
Electrical goods and apparatus, excluding machinery and uninsulated wire	69,078	—	74,122	125,943	—	155,768
Machinery ...	573,533	—	70,344	1,191,937	—	51,331
EXPORTS.						
Electrical goods and apparatus, excluding machinery and uninsulated wire	173,870	—	84,348	443,763	—	68,176
Machinery ...	1,285,868	—	1,747,746	2,949,350	—	3,471,999

New Association : Electric Supply Executive Staffs.—A Committee has been formed of the following chief assistant electrical engineers of undertakings in Greater London, namely :—Messrs. Baron, St. Pancras ; Bowden, Hackney ; Macalister, Islington ; Richardson, Marylebone ; Thompson, Battersea ; and Young, Stepney, with a view to forming an Association on the lines of the Associated Municipal Electrical Engineers of Greater London. The chief object of the proposed Association will be to endeavour to fill the want which has long existed for an Association which will encourage an interchange of ideas, foster mutual interests, and generally create a better understanding between the executive staffs of different electric light undertakings. Previous attempts have been made towards the incorporation of the chief assistants in the parent Association, and the formation of an Association of their own, but, unfortunately, without success. Now that a Committee has been formed, however, it is to be hoped that their endeavours will be crowned with success, and that the Association will, eventually, hold a position second only to that of the parent body.

Hungarian Aluminium Oxide.—It is stated that the Neuhausen Aluminium Industry Co. has concluded a contract with the Bihar Forest Industry and Lime Kiln Co. for the delivery of 50 000 tons of aluminiferous rock (bauxite) per annum as from March 1st, 1915. The latter company, which was originally formed by the L'ége firm of Lamarche, possesses a rope railway, five miles long, which ends in the bauxite district, where arrangements have been made for mining on a large scale. The rope railway joins the Grosswardein-Vaskop local railway, with which the Neuhausen company has also entered into a freight agreement. A certain amount of the production of bauxite is to be treated in Hungary, whilst the balance will be exported, apparently to the Swiss company's new works on the Rhine. This action has partly been suggested by the impossibility of obtaining further supplies of bauxite from France in consequence of the war.

Fatalities.—Sheffield.—According to the *Sheffield Telegraph*, a boy named Walter Carley, aged 15 years, while putting up a new switch on the premises of a relative, a pork butcher at Attercliffe, on 5th inst., received a shock which proved fatal.

Pontymister.—An inquest was held on March 4th as to the cause of death of Joseph Grinnell (32), at Pontymister Works. The evidence showed that while Grinnell and another (G. E. Buck) were in a 10-ft. excavation, Buck in regulating a suction pipe received an electric shock and was thrown on his back. His feet came in contact with the pipe and he was held by the current. He called for help, and Grinnell came to h's assistance. A witness found the two men, and received a slight shock in pulling Grinnell away, but the latter was quite stiff and did not speak again. Witness said he did not realise the risk that he was running by catching hold of the deceased with bare hands. Artificial respiration was tried for 25 minutes. The foreman, as reported in the *South Wales Daily News*, said that the accident was due to the pipe becoming electrically charged, and Benjamin Thomas, who connected the motor, said it would have been impossible to insulate the pipe, but a rubber pipe might have been put down. The verdict was to the effect that deceased was accidentally killed by a discharge of electricity whilst going to the help of another workman.

Abertridwr.—A Cardiff paper reports that an 8-year old boy, named Preece, climbed on the roof of a power station, caught hold of the electric wires, and was killed.

Feeder Reactances.—Feeder reactors are now being installed in the generating station of the United Electric Light and Power Co., New York City. Only two reactors are being employed in each three-phase circuit. The units, which have 3½ per cent. reactance, are porcelain-clad and mounted vertically in pairs to economise in space. The current rating of the feeder cables is 300 amperes. Besides these reactors there are also 18 per cent. units connected between the bus sections, which are designed to carry 2,000 amperes. Further resistance to surges is offered by each generator's inherent reactance, which is about 7·5 to 8 per cent. The rated full-load current for each generator is 1,387 amps. per phase.—*Electrical World.*

Liquidation.—British Prometheus Co, Ltd., Birmingham.—A meeting of creditors is called for March 25th, at 12 o'clock noon, at 26, Corporation Street, Birmingham.

New Electric Clock at Birmingham Post Office.—The G.P.O. are adopting electric turret clocks, when public clocks are required in their buildings, on account of the advantages they offer as regards uniform time-keeping, and the saving on maintenance. Messrs. Gent & Co., Ltd., of Leicester and London, have supplied the first of these clocks purchased by the G.P.O, which has now been erected at the G.P.O., Birmingham. The type selected by the Post Office Engineers is that known as the "Waiting-Train," which is a speciality of the firm mentioned.

The new clock is fixed on the bridge which connects the new portions of the G.P.O. buildings to the old. The dial is 5 ft. in diameter, and is provided with 12 distinguishing marks in lieu of the ordinary Roman numerals, as advocated by the late Lord Grimthorpe. It is arranged for internal illumination, which is provided by electric lamps within a reflector which is disposed behind the dial and is the full diameter of the latter.

The small amount of current required for operating the "Waiting-Train" movement is taken from the accumulator in the building, which has been installed for general purposes. The mechanism is under the constant control of a master clock, the control being effected by the half-minute impulses, in a simple manner, which dispenses with contacts or additional batteries.

The hands of the clock are exposed directly in the open, and therefore a clear reading of the dial is obtained under all conditions, the absence of a covering glass eliminating sun glare and reflection which at some part of the day might prevent the reading of the time. The great power of the "Waiting-Train" movement renders a covering glass unnecessary, the power developed by this mechanism being in direct proportion to the load put upon it, so that the hands cannot be stopped by snow or the most severe gales. Many public clocks were stopped, or others were affected, by the heavy gale that swept over the metropolis a few weeks ago, even Big Ben being half an hour slow.

The largest electric clock in the world, on the Royal Liver Building at Liverpool, which is driven by the "Waiting-Train" movement, has kept time with unfailing accuracy since it was first started on Coronation Day, 1911. The heaviest gales of wind and snow have never affected its time-keeping qualities, despite the great length and weight of the hands required by dials considerably larger than that of London's largest clock, Big Ben

Copper.—The diminution in visible supplies during February, 1915, as shown by Messrs. H. R. Merton's statistical circular, was 750 tons, and in English supplies 775 tons. European arrivals from North America amounted to 16,604 tons, slightly less than during December last. Spain and Portugal supplied England and France with 2,381 tons, a quantity seldom equalled in peace times, and considerably above the 1913 average. A heavy supply was also drawn from countries not individually classified, equal to a fairly good month before the war. Chile shipments were below average, and Australian, though above the quantity for the four preceding months, was not up to average. Total deliveries, at 28,861 tons, exceed those for August, October, or November last by a considerable amount.

Institution and Lecture Notes.—Institution of Electrical Engineers.—The following are the Council's nominations for the vacancies which will occur on the Committee of the Western Local Section:—Chairman, Mr. D. F. Roberts, Cardiff; Vice-Chairman, Prof. D. Robertson, Bristol. Eight nominations to fill five places on the Committee: Messrs. A. J. Abraham, Aberdare; M. T. Evans, Bristol; R. H. Fletcher, Llanishen; W. W. Hughes, Swansea; A. C. McWhirter, Cardiff; W. G. Heath, Plymouth; C. W. Salt, Torquay; A. L. Stephens, Bristol.

At the monthly meeting of the Scottish Local Section, held at Edinburgh on Tuesday last, the paper on "Automatic Protective Switchgear for Alternating-Current Systems" was read by Mr. E. B. Wedmore.

The Students' Section discussed the "Applications of Electrical Engineering to Warfare," on March 3rd. Section (*a*) "Communications," was opened by Mr. P. R. Coursey, who said that fire and flashlight signalling had long ceased to be utilised as a means of official communication, and the applications of electrical engineering had enabled great strides to be made towards the ideals of speed and secrecy. In the present war electrical means of communication were being employed to an enormous extent by all the nations involved, five main types of electrical apparatus being used, as follows:—Wireless telegraph, Wheatstone automatic telegraph, Morse sounder, vibrator telegraph and field telephone, the last two being generally combined in one apparatus. Mr. Coursey gave brief descriptions and illustrations of the most general types of military apparatus. Mr. Smith-Rose referred to the difficulties of reception of wireless messages on aeroplanes on account of the noise of the engine. Mr. Emtage suggested that it might be possible to detect the approach of Zeppelins and submarines by picking up their ignition sparks by wireless receivers; and also described the pneumatic headpiece "shock-absorbers" worn by airmen, which at the same time served to deaden the noises due to the engine, and facilitated wireless reception.

The chairman (Mr. Duddell) said that the great objection to modern methods of communication was that they all gave too much information to the enemy, and in many cases dispatch-riders were proving to be a more secret means of communicating intelligence.

Section (*b*), "The Firing of Mines and Explosives," was opened by Mr. S. Killingback, who said that the advantages of electrical means for firing mines might be briefly summarised as convenience, greater reliability, remote control, simultaneous firing of several charges. Mines and explosives might be fired either by accumulators or by the portable hand-operated service dynamo. The standard types of electric fuses and detonators required a current of about 0·8 ampere for fusing. Mr. Heslop said that the chief field for electrical firing of mines was for harbour protection, as reliable connections and cables could then be laid. The ordinary time-fuses were generally satisfactory in other cases.

Section (*c*), "Searchlights and Projectors," to be opened by Mr. E. L. M. Emtage, was adjourned to March 31st next.

At the meeting of the Yorkshire Local Section on Wednesday last, a paper was read by Mr. W. R. Cooper, on "Electric Cooking: Mainly from the Consumers' Point of View." The same paper was to be read last night in London.

National Association of Colliery Managers.—In a paper on "The Electric Safety Lamp in Mines," read to the Association in Edinburgh, on Saturday, Mr. John George, Cambuslang, pointed out that it had to be admitted that the first cost of flame lamps was lower than that of electric lamps, but first cost was not everything; with the reduced light furnished by flame safety lamps it was nearly impossible to keep coal clean, and, in many instances, managers had to pay for dirt when they ought to be getting coal. Then owing to the same cause they were always liable to have falls of roof and sides. There was no doubt that the number of electric lamps in daily use in the mines was increasing by thousands every year, one firm alone having 75,000 lamps in daily use in the pits.

Edison and Benzol.—Mr. T. A. Edison is said to have turned his attention to the problem of recovering benzol from coke-making plants; it is reported that he is engaged on the construction of a plant for that purpose in accordance with his own designs, at Johnstown, Pennsylvania, adjoining the by-product coke ovens of the Cambria Steel Co.

Russian Trade.—*Apropos* of the references to this subject in our leading columns to-day, we are in touch with a French engineer of considerable experience, who speaks and writes Russian fluently, and has business relations with Russia; his services are at the disposal of any reader who is desirous of establishing trade with that country.

Educational.—A well-equipped laboratory for electro-technical work was recently opened at the Madras College of Engineering, which can now provide courses of instruction up to the highest standard demanded for engineering work in India.

Appointments Vacant.—Engine driver and switchboard attendant (30s.), for Royal Holloway College, Englefield Green, Surrey; junior shift engineer (25s.), for Heywood Electricity Works; fitter (36s.), for Royal Holloway College, Englefield Green, Surrey; a cable engineer is wanted by a company which intends erecting works for the manufacture of vulcanised rubber cables. See our advertisement pages to-day.

Electric Vehicle Charging Stations.—We learn that the General Electric Co., Ltd., have been appointed official manufacturers to the Electric Vehicle Committee of the standard design of illuminated box sign for charging stations and for garages where charging facilities are provided. The sign, wired complete, with terminal box, and arranged for bolting to the face of a wall, or supporting from the usual type of bracket, is made in four standard sizes. The two standard sizes, 30 in. square and 18 in. square, each size with either a single or double face, are those recommended by the Electrical Vehicle Committee. This sign is also the subject of a leaflet, No. F. 1,887. The frame and case are of stove-enamelled iron, black outside and white inside, and the panels are of duplex glazing, formed of a front sheet fired with red and white permanent colours, backed by a sheet of clear glass. The advantages of this method of glazing are:—Bright colours which show well both by day and night; strength; and smooth surfaces on both sides of the panel, which keep clean longer and are easily cleaned.

Action Against the Marconi Co.—For some days past Mr. Justice Avory and a special jury have been occupied with the hearing of the case of J. W. Hamilton *v.* Marconis' Wireless Telegraph Co., Ltd. The plaintiff, who acted as defendant's sole agent in Australia and secured a number of important contracts there, claims damages for wrongful termination of his engagement. The company has a counterclaim for damages. The hearing stands adjourned.

Patents and Alien Enemies.—Application has been made to the Board of Trade by the Manchester Armature Repair Co. to avoid or suspend the following patents:—10,457/06, granted to Hopfelt; 2,711/10, 20,634/10 and 9,941/11, granted to the Specialfabrik für Aluminium-Spulen und Leitungen G.m.b.H.; and 27,651/12 granted to Loewenthal. The hearings are fixed for March 23rd.

For Sale.—Salford Corporation invites tenders, by March 22nd, for the purchase of storage battery, booster, two balancers and electric motors. Particulars are given in our advertisement pages to-day.

Black Smoke Offences: Electrical Cable Manufacturers and War Orders.—Two electrical cable manufacturers having works in Manchester were amongst a number of defendant firms summoned at the Manchester Police Court on Wednesday for permitting emissions of black smoke from their works' chimneys. A representative of one of the firms suggested that the local Sanitary Committee (who authorise these prosecutions) should allow more latitude under the present exceptional circumstances. They were busy on army contracts, and their difficulties were added to by the fact that they had been, owing to enlistments amongst the men, compelled to find fresh firemen. They had had five firemen in one month, and the man they had now was not satisfactory.

A similar representation was made in the second case, but fines and costs were, nevertheless, imposed in each case.

Pocket Torches.—According to a note in the *Evening News*, a British-made battery, as good as the German article but at a lower price, called the "Diehard," is now available for pocket torches. This battery, we may add, is made by Messrs. Signum, Ltd., of 46, Kingsway, W.C.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—Under a scheme for the re-arrangement of the staff of the Walsall electric supply department, the following and other alterations are proposed:—Management staff—(1) C. W. Cookson, now chief clerk and collector, to be accountant and collector at his present salary; (2) D. Mills, second clerk (now £104 per annum), to be appointed chief clerk, at £130 per annum, increasing by £10 annually to £150 per annum. Distribution staff—(1) a meter tester and installation inspector to be appointed at £2 2s. per week, rising to £2 10s. per week; (2) E. Eynon, senior sub-station attendant, to be temporarily sub-station foreman, at £1 17s. 6d., rising to £2 2s.; (3) new sub-station attendant to be appointed at (probably) 30s. per week; (4) the wages of sub-station attendants, G. Albidge and J. Stokes, to be advanced by 2s. 6d. per week each. Sales department staff—(1) the canvasser (Mr. H. Hopkinson) to be sales engineer and canvasser, at £2 7s. 6d. per week, an increase of 5s. 6d. per week. The question of appointing a separate canvasser has been deferred for three months. The immediate annual increase in salaries and wages under the proposed re-organisation is £438, a large proportion whereof is in respect of new work which will be self-supporting.

Mr. J. Ellis and Mr. V. A. Woodland have resigned their appointments as shift engineer and meter inspector, respectively, at the Watford electricity works. Increases in the salaries of the undermentioned employés at the electricity works, are to be made as follows:—J. E. Walley, mains engineer, £145 to £170 per annum; W. Middleton, shift engineer, £90 to £100 per annum, rising by annual increments of £5 to £110; E. E. Pope, shift engineer, ditto; F. H. Johnstone, meter inspector, 30s. to 35s. per week. The Electricity Committee has been given authority to select candidates and make appointments in all vacancies coming under its notice up to and including £100 per annum.

Mr. J. H. Parker, on leaving the Greenock electricity works to take up his position at Croydon, was presented by the staff and employés with an electric floor standard and shade. Mr. F. H. Whysall, chief engineer, made the presentation.

Mr. C. Crandon has resigned his appointment as switchboard attendant at the Tunbridge Wells electricity works in order to take up an appointment at the Chelsea electricity works.

Woolwich T.C. on March 3rd increased the salary of Mr. S. H. Penning, deputy electrical engineer, by two equal instalments of £15, to a maximum of £250 a year; and that of Mr. C. Hobson, charge engineer, from £130 to £140.

Lancaster T.C. has appointed Mr. J. B. Patterson, works superintendent at the electricity works, as assistant engineer, he to be paid £3 3s. per week whilst the electrical engineer is absent on military service.

Rotherham T.C. has appointed Mr. J. R. Lilleker, who has been on the staff for 14 years, as assistant electrical engineer, at a salary of £200 a year. He succeeds Mr. J. Williams, who is now electrical engineer and tramway manager at Erith.

Maidenhead T.C. has appointed, out of over 150 applicants, Mr. William Edward Claret, of South Tottenham, as station superintendent at the electricity works, at £175 per annum.

Mr. H. E. Wright, of the Dover Corporation electricity staff, has resigned, and his successor is Mr. Byles, an old student at the works.

Mr. H. H. Partington, who was appointed to the sub-station superintendent vacancy at Salford, has now decided to remain with the Scottish Central Electric Power Co., Falkirk.

Tramway Officials.—The Plymouth Tramways Committee has recommended the appointment of Mr. C. R. Everson a tramways manager, at a salary of £500 a year and house, for three years from November 9th, 1914, with an option to extend the term for a further period of a year, the compensation to which Mr. Everson is entitled to be suspended whilst he holds the office.

The Darlington T.C. has appointed Mr. Fraser, of Kilmarnock, as tramway traffic manager.

General.—The foremen of Messrs. Howard & Bullough, presented Mr. G. W. Somerville with a smoking cabinet suitably inscribed, and a gold mounted walking stick, as a token of esteem, on his resignation of the position of chief electrical engineer at Globe Works last week. The presentation was made by Mr. James Arrowsmith, the oldest foreman. Mr. Somerville had previously been presented with a suit case and military hairbrush by the men employed in the firm's electrical department. He is now interested in the Unity Wood and Iron Co., Padiham, and is also in practice as a consulting and inspecting engineer.

We are informed that Mr. R. T. Durran, an English director of the Allgemeine Elektricitäts Gesellschaft, Berlin, and its English and foreign subsidiary companies, who was responsible for the organisation and management of the A.E.G.'s large foreign business, returned to this country from Germany some months ago. We understand that Mr. Durran's departure from Germany was made possible by the assistance of Dr. Rathenau and Mr. Deutsch, the heads of the A.E.G.

Mr. V. T. Taylor, who, we understand, is well known in South African electrical circles, has recently returned from the St. John Del Rey Gold Mines, Brazil, and has taken up a position with Sir W. Armstrong, Whitworth & Co., Elswick Works, for the duration of the war.

Mr. A. P. Trotter's official address is 8, Richmond Terrace, Whitehall, London, S.W., and not the one printed by accident in the List of Members of the Institution of Electrical Engineers.

Mr. Reginald P. Wilson is now on his way back to London, after an extended visit to South America.

Mr. George Balfour has joined the board of the Cordoba Light, Power and Traction Co., Ltd.

Obituary.—Mr A. L. E. Drummond.—The death occurred in Newcastle-on-Tyne on 5th inst. of Mr. Alfred L. E. Drmmond, manager of the Post Office telephones in the city, and formerly manager for the Newcastle District for the National Telephone Co., who was a past president of the Newcastle local section of the Institution of Electrical Engineers. Mr. Drummond was born at Scarborough in 1860. He served his apprenticeship with Messrs. Crooks Roberts & Co., engineers, of Sheffield, and then went to London. In 1881 he returned to Sheffield as secretary and assistant-manager to the Telephone Exchange and Electric Lighting Co. Five years later he joined the National Telephone Co. as district manager in the Potteries. Later Mr. Drummond was transferred to Leeds, afterwards to Manchester, then to Oldham, and four years later to Plymouth. In 1902 he was appointed manager of the Newcastle district, and on the purchase of the National Company's system by the Government he continued in that position.

Mr. H. Garbutt.—We regret to hear of the death of Mr. Harry Garbutt, representative for many years of Messrs. I. Frankenburg & Sons, Ltd., cable makers, Salford, Manchester.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Robert W. Blackwell & Co., Ltd. (63,446).—Capital, £250,000 in £1 shares. Return dated January 14th, 1915. All shares taken up. £1 per share called up on 75,007 and 10s. per share on 25,000; £87,507 paid, £149,992 considered as paid on 149,993 shares. Mortgages and charges: Nil.

Adelaide Electric Supply Co., Ltd. (84,209).—Capital, £500,000 in 50,000 pref. and 50,000 ord. shares of £5 each. Return dated January 5th, 1915. 43,805 pref. and 50,000 ord. shares taken up. £5 per share called up on 43,805 pref. and 24,000 ord.; £339,025 paid, £130,000 considered as paid, 26,000 ord. Mortgages and charges: £219,572 five per cent. debenture stock. (A further 959 pref. shares were allotted, payable in cash, to February 3rd, 1915).

Burmah Electric Tramways and Lighting Co., Ltd. (75,070).—Capital, £200,000 in 20,000 ord. and 20,000 pref. shares of £5 each. Return dated December 31st, 1914. All shares taken up. £100,000 paid on the pref., £100,000 considered as paid on the ord. Mortgages and charges: Nil.

E. S. Co., Ltd. (139,230).—Particulars of £20,000 debentures, created February 11th, 1915, filed pursuant to Section 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Creed Bille & Co., Ltd.—Two mortgages, one as collateral security, both dated February 4th, 1915, to secure £1,500, charged on land in Cherry Orchard Road, Croydon, with buildings thereon, formerly known as the Croydon Skating Rink, and benefit of building agreement relating to certain lands in Cherry Orchard Road, Addiscombe Road, Colson Road, and Cedar Road, Croydon. Holder: W. T. Bolland, 22, Colson Road, Croydon.

National Telewriter Co., Ltd.—Particulars of £15,000 debentures, created February 26th, 1915, filed pursuant to Section 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £2,000. Property charged: The company's undertaking and property, present and future. No trustees.

CITY NOTES.

The Mackay Companies.

The accounts for the year ending February 1st last show about the same figures as were issued last year, with the exception of operating expenses, which show an increase of $29,997, a trifle when compared with capital liabilities of $91,380,400. The income from investments in other companies is more this year by $43,601, while the cash assets are up by $117,964. We have on previous occasions remarked on the meagre nature of the accounts, which do not give a proper conception of the financial state of the Trust. To mention one instance again, it is not stated if the investments in other companies are "at cost" or "market value," and until this is stated uncertainty must exist. Nothing has apparently been carried to reserve, and in this connection it may be mentioned that last year it was stated that "reserves have been increased not so largely as in previous years, but substantially." This, taken in conjunction with the remark that the trustees have been compelled to insist on the most rigid economies in operating expenses, is not very encouraging. Notwithstanding the tendency towards lower rates, the trustees are prepared to lay a cable to compete with the Western Union in Mexico, and so cut rates still further, and the "Cuban" rate war is quite fresh in our memories. When talking about increasing rates the trustees are treading on very delicate ground, and it remains to be seen how far success will attend efforts in this direction, particularly in vew of the extension of cheap rate services by other Atlantic telegraph companies. Is the capacity of the Atlantic cables being used to the full? The volume of traffic available is enormous, and it is a question how far the policy of refusing to take night and week-end letters adversely affects the commercial lines. Of course, due allowance must be made for the existing disturbed trade conditions, which, it is hoped, will soon terminate and lead to the usual brisk business.

Neuhausen Aluminium Industry Co.

The report for 1914 of the Aluminium Industrie A.G., or Neuhausen, states that favourable results were obtained, but nothing is mentioned as to the situation of the market or the influence of the war on this particular trade. The financial figures, permitting of the payment of a dividend of 20 per cent. on old share capital, as in 1913, and of 10 per cent. on new share capital, were reproduced in this journal two or three weeks ago. It appears that while the works at Neuhausen and Rheinfelden experienced no capital changes as contrasted with 1913, and those at Lend-Rauris underwent a slight diminution in consequence of the sale of a site, an increase of £124,000 took place in connection with the Vallais works, which was chiefly incurred in the Borgne water-power plant and the extension of the Rhone works. It will be possible to bring the Borgne plant in operation as soon as required. The extension of the works at Marseilles and the participation in bauxite mines have raised the capital expenditure on these from £287,000 to £485,000, but a reduction has occurred in the Goldschmieden-Trotha auxiliary company. The Neuhausen company has taken up as a new interest £68,000 in the Martius Works of Bergheim, near Cologne, which is to produce bauxite.

Hastings and District Electric Tramways Co., Ltd.

During 1914 there was a decrease in the traffic receipts of £3,141, entirely attributable to the war. The expenditure shows a decrease of £4,101, which is in excess of the falling off in the receipts. The revenue after crediting receipts from the statutory company, £19,349, and transfer fees £7, and debiting administration expenses £1,338, shows a balance of £18,018, plus £1,037 brought forward. Deducting £10,633 for interest charges, there remains available £8,421. Owing to the uncertain financial outlook in October last, the directors thought it best to hold back the interim dividend on the preference shares, but they now propose to pay a final and complete dividend of 6 per cent. for the year, absorbing £4,800; £1,000 is to be transferred to depreciation account, to write £1,500 off suspense account, and to carry forward £1,121. The installation of the Tilling-Stevens petrol-electric system on the front line has been carried out. The 17 cars required for the purpose were duly converted, and the last of them were placed in operation during the month of July, since when the system has worked satisfactorily.

Mr. Geo. Kitchin, who presided at the annual meeting held on Tuesday at the offices, 1, Queen Victoria Street, E.C., referred first to the general disturbance that had resulted from the war. This company's receipts had fallen, since the war began, by about 30 per cent. Fortunately, it had been possible to curtail the expenses; but had they gone on as they were doing up to the end of July they would have had an increase in receipts as well as a reduction in their working expenses. Up to the outbreak of the war they had an increase of £570 on their traffics, whilst the reduction of working expenses had been continuous throughout the year. The traffic receipts of the Hastings company amounted to £50,204, plus £632 for advertising, etc. On the expenditure side, a decrease was shown in each item, the total saving being £4,101. Over £3,000 of this sum was a saving on maintenance and repairs. These had now been reduced to a normal figure, the shortcomings of previous years having been made good. The total amount expended was £31,488. Bringing down the balance, £19,349, to the Hastings and District revenue account, and deducting their usual London expenses, together with debenture interest, and interest paid to bankers, and adding £1,037 brought forward, they had £8,421. It was proposed to carry £1,000 to depreciation account, which would then stand at £26,000, and to write £1,500 off the suspense account, which stood on the credit side of the balance sheet and represented legal and other expenses incurred in the installation of the petrol-electric system. These cars were working in a satisfactory manner. At first there were some difficulties with the lighting and the tanks for the petrol which were placed in the cars; but these difficulties had now been overcome; the 17 cars had been at work for several months, and they heard of no complaints from the public. The loan from the bankers of £5,500 had been reduced to £4,000. Following the promise made to them last year, they had carried the whole of the cost of their petrol-electric installation to a suspense account which they proposed to write off by steady annual payments, so as to get rid of the danger which there was of having an item standing to the credit of their journal which could not be justified. They were not yet free of the contractors, but the item which stood on the balance sheet represented the whole of the outlay which was involved in this change. In October last, when they should in the ordinary course have paid an interim dividend on the preference shares of the company, they did not consider that the position of the company would allow of their doing so, as the financial outlook was dark, and they were not convinced that the petrol-electric system which they were installing would answer; therefore

they decided to hold back the preference dividend until the end of their financial year, when the final figures would enable them to see more clearly what the position was. That day they were hoping to pass a resolution authorising the payment of that dividend, though it was not proposed to send out the cheques for it until the end of the present month. At the same time, he wished to warn them that it was possible that the preference dividend might not be earned during the current year, as the figures for 1915—comparing with those of 1914—would probably for the first six months show a considerable shrinkage. They would possibly be desirous of knowing how they were situated with regard to the local authorities, and he regretted that he was not in a position to give them any satisfactory intelligence on this point. The wish of the board was, and always had been, to work amicably with the Corporation, but for some reason or other it would appear that the committee which controlled these affairs was not able to see eye to eye with the directors on any point, and was continually throwing obstacles in the way of their improving the services. Still, they could only hope that this state of things would not continue indefinitely. The Chairman referred to the death of the late general manager, Mr. Holliday, and said that as his successor they were fortunate in having to hand Mr. Edwards, who had been managing the company's affairs during Mr. Holliday's illness. They therefore appointed him general manager, and the result they saw that day was the effect of the appointment. The efficiency of the company had not suffered by the change, and the work in Hastings was well and effectively supervised.

Mr. J. C. Williamson seconded the motion.

Mr. Webb asked if the board anticipated much reduction in expense from the adoption of the petrol-electric form of traction on the front at Hastings.

The Chairman said that last year he stated there would be an increase of expense by the introduction of the petrol-electric system, and he had no reason to alter that opinion that day. The cost of petrol would be to a considerable extent added cost, and there would also be the cost of the maintenance, which was a considerable item on the cars which were fitted for that purpose.

Newcastle and District Electric Lighting Co., Ltd.—The annual meeting was held on 5th inst. in Newcastle-on-Tyne, Sir Benjamin C. Browne, who presided in the absence of Dr. J. B. Simpson, first referred in some detail to the capital account. Dealing later with the profit and loss account, he said that the item £11,388 for wages, salaries, and rates, &c., showed an increase of £1,023, largely accounted for by an increase of £760 for rates due to a new assessment of the company's works and mains. The total gross receipts for electrical energy showed an increase of £7,514 over 1913. These receipts had been adversely affected due to the earlier closing of licensed premises and the reduction of lighting in shop fronts, &c., but this had been compensated for by the increased demand for power purposes. The gross profits for the year were £32,030, being an increase of £1,206, and the amount available for distribution was £21,293. The arrangement made with Messrs. Spencer & Sons, of Newburn, to utilise the whole of their exhaust steam had now come into force, and the directors felt confident that this would be the means of a great saving in the working costs. The dividend at the rate of 3 per cent. was approved.

Chelsea Electricity Supply Co., Ltd.—The profit for 1914 was £37,810, plus £2,766 brought forward and £2,201 for interest, making a total of £42,777. After deducting interest on debenture stock, £7,875, interim dividend on the preference shares at the rate of 6 per cent. per annum, £900, and interim dividend on the ordinary shares at the rate of 4 per cent. per annum, £4,944, £29,058 remained. It is intended to appropriate this as follows:—To credit of reserve for renewals, depreciation and contingencies, £14,420; debenture stock premium redemption fund, £704; written off cost of extinction of founders' shares, £1,089; written off cost of investments, £1,429; final dividend on the preference shares, making 6 per cent. for the year, £900; final dividend on ordinary shares at the rate of 6 per cent. per annum, making 5 per cent. for the year, £7,415, leaving to be carried forward £3 101. The number of 8-c.p. lamp equivalents connected on December 31st, 1914, was 314,275, an addition of 7,854 during the year, and the total number of units sold was 4,342,182, being 108,983 less than for the previous year. The annual meeting was held yesterday.

Newmarket Electric Light Co., Ltd.—During 1914 the equivalent of 1,015 33-watt lamps were connected to the mains, making the total connected 30,744 lamps. The profit on the year's working, plus £146 brought forward, amounts to £2,464, which, after providing for debenture and other interest, £733, leaves £1,731. The directors recommend a dividend of 3½ per cent., that £650 be carried to reserve for renewal of plant, and that £151 be carried forward.

Direct Spanish Telegraph Co., Ltd.—The dividend at the rate of 10 per cent. per annum on the preference shares, less income-tax, and one at the rate of 4 per cent. per annum on the ordinary shares, free of income-tax, are recommended for the half-year ended December 31st, 1914. In addition a bonus on the ordinary shares of 2 per cent. for the year 1914, free of income-tax, is to be paid.

British L. M. Ericsson Manufacturing Co., Ltd.—For 1914 the directors report that, notwithstanding the abnormal conditions of trade, the company's business continues to show a most satisfactory result. £25,000 appearing in the balance-sheet as on deposit with Aktiebolaget Stockholms Handelsbank was withdrawn on January 1st, 1915, and a corresponding amount of war loan has since been purchased. The net profit, after charging £10,906 for depreciation and £2,500 for debenture interest, amounts to £20,615, plus £6,409 brought forward, making an available balance of £27,023. After paying the preference dividend, amounting to £5,999, a dividend of 8 per cent. per annum is to be paid on the ordinary shares, requiring £8,001, placing to reserve account £6,000, and carrying forward £7,023. Annual meeting, March 17th.

Hadfields, Ltd.—In reporting upon the position of the company at December 31st, 1914, the directors propose to add £26,000 to the reserve and renewal account and carry forward £60,270. They recommend that in addition to the interim dividend of 1s. per share paid in August last, a further dividend be paid on the ordinary shares of 2s. per share, together with a bonus of 1s. 6d. per share, all free of income-tax. Mr. J. P. Crosbie, works manager, and Mr. W. B. Pickering, commercial manager, have been elected directors.

Ramsgate and District Electric Supply Co., Ltd.—Including £1,034 brought forward, the gross profits for 1914 amount to £5,070, and after allowing for interest at the rate of 5 per cent. per annum on outstanding accounts due to the contractors, and writing off the cost of creating debenture stock, there is a balance of £3,724. The directors recommend the payment of a dividend of 5 per cent., and that £1,200 be placed to the reserve account, leaving £1,524 to be carried forward.

Canadian General Electric Co., Ltd.—A quarterly dividend of 1¾ per cent. for the three months to March 31st, being at the rate of 7 per cent. per annum, on the common stock, and a half-yearly dividend of 3½ per cent. for the six months to March 31st, being at the rate of 7 per cent. per annum on the preference stock, are announced.

Hydro-Electric Power and Metallurgical Co., Ltd.—The *Financial Times* says that a meeting of the holders of the debentures is being held to-day to approve resolutions accepting allotment by the Government of Tasmania of £137,750 4½ per cent. Tasmania inscribed stock, to be paid forthwith, and to distribute the stock among the debenture-holders in exchange for the debentures held by them at the rate of £95 of the stock for each £100 debenture, and £19 for each £20 debenture.

Alley & MacLellan, Ltd.—The *Times* states that the profits for 1914, including £1,741 brought forward, amounts to £25,272. The directors have allocated £9,113 to depreciation and £10,000 to reserve, and recommend that the dividend on the preference shares for the year be paid, leaving £1,908 to be carried forward. Last year a dividend of 6 per cent. was paid on the ordinary shares.

Calcutta Electric Supply Corporation, Ltd.—The number of units sold to consumers during the five weeks ended January 29th, 1915, amounted to 1,254,082, compared with 1,387,896 in the corresponding five weeks of 1914. The reason for the decrease is general slackness of business in Calcutta owing to the war.

Stewarts & Lloyds, Ltd. — After setting aside £100,000 for depreciation, dividends of 10 per cent. per annum on the preferred ordinary shares, and 2s. each on the deferred shares (making 2s. 6d. per share for the year), are recommended, placing £50,000 to reserve fund, and carrying forward £97,000.

British Westinghouse Electric and Manufacturing Co., Ltd.—The directors have decided to pay a dividend on the preference shares for the year ended December 31st, 1914, at the rate of 7½ per cent.

Automatic Telephone Manufacturing Co., Ltd.—The profit for 1914 amounts to £35,797, against £22,941 for 1913. After payment of preference dividend and writing off £10,960, as against £8,093, a dividend of 3 per cent. for the year on the ordinary shares is declared, carrying forward £5,256 against £3,218. The transfer-books will be closed from 12th to 20th instants.

International Light & Power Co., Ltd.—A dividend of 1½ per cent., less British income-tax, on the preference shares is announced for the quarter ending March 31st.

Globe Telegraph and Trust Co., Ltd.—Interim dividend, 2s. per share, free of income-tax, on the ordinary shares for the past quarter.

Altrincham Electric Supply Co., Ltd.—A dividend of 10s. per share on the deferred shares, subject to tax, is recommended.

Brompton and Kensington Electricity Supply Co., Ltd.—After appropriating to depreciation and sundry reserve accounts sums amounting to £12,121, the directors recommend a final dividend on the ordinary shares at the rate of 11 per cent. per annum, making 10 per cent. for the year, carrying forward £5,625. For 1913 the dividend was at the same rate.

City of London Electric Lighting Co., Ltd.

Capital expenditure during 1914 upon additions, extensions and replacements amounted to £61,939, making the total £2,622,813. There was written off prior to December, 1913, £566,984, and a further £21,210 has been written off in respect of buildings, plant and other works dismantled during the year 1914, so that the net expenditure at December last was £2,034,619, showing an increase of £40,729 for the year. The balances at credit of the reserve funds stand as follows:—Reserve account No. VI. £175,885, first debenture stock premium redemption account No. VII. £66,019, leasehold redemption account No. VIII. £5,088, reserve for doubtful debts £1,808, plus the amount proposed to be carried forward to 1915 £23,372, making the total £272,173. The annual profit has naturally been prejudiced by the enforced reduction of lighting and by the increased cost of coal and of all other items of production. The total revenue for the year, £303,543, including interest on investments and discounts £2,541, was £306,084. Expenses of generation and distribution were £72,065, repairs and maintenance of buildings, machinery, plant, mains and other works £11,076, rent, rates, taxes, management expenses and special charges £58,478, leaving £164,465, plus £27,837 brought forward, making a total available revenue of £192,301. Of this sum the following amounts have been distributed or provided for:—Interest on loan from bankers, consumers' deposits, etc., £3,292, interest on first and second debenture stock for 1914 £30,918, interest transferred to debenture stock premium redemption account £1,547, leasehold redemption account, interest and appropriation £288, contributions to employés' provident funds and under National Insurance Act £1,958, stores written down £138, transfer to reserve account £50,000, leaving available £104,160. After paying 6 per cent. on the preference shares for 1914, and a total dividend of 9 per cent. for the year on the ordinary shares, as compared with 10 per cent. for 1913, £23,372 is to be carried forward.

The following tables show the position at the end of 1914 and 1913 respectively, but owing to the war no true comparison can be made:—

	1913.	1914.	Decrease.
Gross revenue from all sources ...	£314,313	£306,084	£8,229
Net revenue	174,590	164,464	10,126
Distribution on ordinary shares ...	10 per cent.	9 per cent.	

PRIVATE SUPPLY FOR ALL PURPOSES: AVERAGE PRICES PER UNIT OBTAINED.

In 1911, 2.39d.; 1912, 2.37d.; 1913, 2.33d.; 1914, 2.26d.

CUSTOMERS AND CONNECTIONS (PRIVATE SUPPLY), AFTER ALLOWING FOR DISCONNECTIONS ON ACCOUNT OF REMOVALS, SUBSTITUTION OF METALLIC FILAMENT LAMPS, ETC.

	1913.	1914.	Increase.
Number of customers being supplied	15,083	15,090	7
Number of KW. connected (including power and heating)	43,703	45,532	1,829

On February 17th, 1915, there were 46,678 KW. applied for, out of which 45,831 were connected, and the customers numbered 15,060.

TOTAL UNITS GENERATED, SOLD, ETC.
(Including Public Street Lighting.)

	1913.	1914.
Generated	33,542,870	33,906,963
Sold	29,112,618	29,182,165
Metered and used by the company	1,490,078	1,861,660
Expended in distribution, etc	2,940,174	2,863,138
Maximum supply demanded	19,433 KW.	19,739 KW.

The total units sold show an increase of 69,547 over 1913.

Power and heating supplies continue to show a steady increase, the total units sold for these purposes in 1914 being as follows:—Power, 11,500,946 units; heating, 2,193,827 units; = 13,694,773 units, equal to 48.6 per cent. of the total units sold for private supply. The directors mention the withdrawal of the County Council's 1914 Bill and the two London Power Bills of the present Session.

Annual meeting, March 16th.

County of London Electric Supply Co., Ltd.

The directors report that the capital expenditure during 1914 in the London districts was £145,851, making the net total in respect of those districts £2,098,549. The balance from revenue account, after deducting generation and distribution costs, rents, rates, taxes, wages, directors' fees, general establishment and other charges, and proportion of salaries, was £164,043, plus £7,013 brought forward. Interest on the first and second debenture stock and interest on temporary loans, less income tax, absorb £44,215; there is carried to reserve for depreciation, repairs, renewals, etc., £40,000, leaving £86,841 for distribution. Interim dividends on the 6 per cent. preference and on the ordinary (5 per cent.) already paid absorbed £29,909, leaving £56,933. The directors now recommend a further dividend on the 6 per cent. preference shares and a further dividend on the ordinary shares for the December half-year at the rate of 9 per cent. per annum, less income tax, leaving £12,471 to be carried forward. The applications received during the past year amounted to the equivalent of 5,206 KW., making the total 54,705 KW. The total units sold were 28,012,741, an increase of 2,269,418 units. The number of consumers has increased during the year from 22,315 to 24,212. In view of the lighting restrictions imposed upon the London areas by the Admiralty in consequence of the war, and which have affected the output, particularly for the last quarter of the year, the directors consider the results eminently satisfactory. The issue of 10,000 six per cent. cumulative preference shares and 6,000 ordinary shares made in March last was over-subscribed. Reference is made to the withdrawal of the two London Electricity Supply Bills that were before the present Parliamentary Session. The directors of the Bournemouth and Poole Electricity Supply Co., Ltd., have declared a final dividend on the ordinary shares at the rate of 9 per cent. per annum, making 7 per cent. for the year. The progress made by the Coatbridge and Airdrie Co. during the past year has been satisfactory.

Units generated and purchased	36,781,413
Quantity sold—Public lamps	207,632
Private consumers by meter	27,805,049
Total sold	28,012,741
Used at works	3,145,751
Total accounted for	31,158,492
Not accounted for	5,622,921
Public lamps	363
Total maximum supply demanded, KW.	13,700

Annual meeting, March 15th.

Bournemouth and Poole Electricity Supply Co., Ltd.

The directors' report for 1914 shows that new capital expenditure amounted to £14,553, making the total £487,049. The balance from revenue account, after deducting generation and distribution costs, rent, rates, taxes, wages, directors' fees, general establishment and other charges, and proportion of salaries, is £41,681, plus £2,145 brought forward. Out of this, interest on debenture stock and interest on temporary loans, less income tax, absorb £9,965, leasehold and special redemption funds and interest £1,899, written off suspense accounts £21; carried to reserve for depreciation, etc., £7,000, leaving £24,941 available. Interim dividends on the 4½ and 6 per cent. preference shares, and on the 15,000 ordinary shares (5 per cent. per annum) for the June half-year amounted to £9,337, leaving £15,604. After paying the final dividends on the preference shares, a final dividend on the ordinary shares at the rate of 9 per cent. per annum for the December half-year, less income tax, is declared, leaving £3,829 to be carried forward. The total applications received amounted to the equivalent of 9,664 KW., being an increase of 874 KW. for the year. The total units sold for all purposes was 3,910,511. The Richmond (Surrey) Electric Light & Power Co., Ltd., has declared a dividend of 6 per cent. on the ordinary shares.

Units generated	5,139,370
Units sold—Public lamps	26,850
Private consumers by meter	3,883,661
Total sold	3,910,511
Used on works	3,145,751
Total accounted for	4,447,367
Not accounted for	692,003
Public lamps	161
Total maximum supply demanded, KW.	2,732

Annual meeting, March 18th.

Scarborough Electric Supply Co., Ltd.

Mr. G. Alderson Smith presided at the annual meeting, held at Scarborough, on February 27th. He referred regretfully to the death of the Secretary (Mr. John Hall, J.P.), who was one of the victims of the bombardment of Scarborough. "I think," he said, "this is the 23rd annual meeting, and at all before this Mr. John Hall was very much in evidence and always gave us all the help he could." Proceeding, the Chairman characterised the financial report as a war budget, because the war was the whole thing that influenced them. In effect, they had done very well, because after the first seven months of the year, the remaining months, when they ought to have made their large profit from the hotels and places of amusement, brought them nothing. That was where their loss had been. Practically, the amount brought forward for balance applicable to dividend on the ordinary shares this year was £3,847; last year it was £3,848. If it had not been for the war they should have had a record season. They had spent £285 more on coal. Under other headings they had also spent more. There was not only the war, but also the bombardment of Scarborough. About two hundred of their customers shut up their houses and bolted. They had great difficulty in getting in to read the meters. They had sent circulars to people asking them to send their keys or indicate where the keys were. Twenty had not taken any notice. He thought the refugees had done more harm to Scarborough than the bombardment. He moved the adoption of the report and balance-sheet, with a dividend of 2 per cent., less income-tax. This would absorb £2,000, and he explained that they were carrying £1,000 forward against whatever this year might have in store for them. They could only hope that it would be possible for lighting restrictions soon to cease.

Mr. Harold T. Ellis, seconding, said the total number of units supplied was very considerably greater than it had ever been before, and was, he thought, a record. The position brought about by the introduction of the one-watt lamp, which at first did the company considerable harm owing to its extreme efficiency, had now been about recovered by the extra connections. The increase of connections this year amounted altogether to an equivalent of 250 KW., an increase of consumers of 10 per cent. They had in front of them the prospect of the half-watt lamp, which would still further reduce their consumption until they could increase their con-

sumers. When it came they could look forward with confidence to being in a much better position to compete against gas. He was afraid there was not much prospect of their being able to make their coal contracts next June at any cheaper rate, and one had to realise, with things as they were at Scarborough now, that their prospects for this year were not very bright.

The resolution was adopted.

The CHAIRMAN remarked that Mr. F. G. Holden, B.A., A.M.I.C.E., had been appointed secretary and manager, thus combining the two offices.

Waste Heat and Gas Electrical Generating Stations, Ltd.

THE profits earned by the company during the year ended January 31st, 1915, after deducting administration expenses, amount to £39,001, as compared with £38,245 in the previous year, less £10,500 transferred to the credit of reserve account, and adding £12,110 brought forward. The profits available are £40,611, as compared to £37,710. A dividend at the rate of 8 per cent. for the year (the same as for 1913) requires £25,600, and there is to be carried forward £15,012, against £12,110. The reserve account is now £53,351, and the redemption funds in respect of plant supplied on hire purchase terms amount to £11,299. The supply of waste heat and gas and the output of electrical energy from the company's generating stations has on the whole been satisfactorily maintained throughout the year. No new generating stations have been erected since the last report, but negotiations have recently been taking place for some additional plant to be installed at Weardale Power Station with a view to the more efficient utilisation of the gas received from the coke ovens. It has also been arranged to erect some further plant at the company's Grangetown power station with the object of maintaining a greater output from that installation. These new works can be carried out at a cost within the cash resources which the company has available and should in due course yield a satisfactory increase in the revenue.

The company applied for and was allotted £10,000 of the National War Loan 1925-1928, and £3,500 was called and paid up to the date of the accounts now presented.

In November the directors made a preliminary donation of £200 to different relief funds in connection with the war, leaving the matter for the further consideration of the shareholders at the annual meeting. A resolution will accordingly be moved that the company's contribution out of the profits of the past year be increased to £1,000, to be allocated at the discretion of the directors.

The annual meeting was held on Wednesday.

W. T. Glover & Co., Ltd.

THE result of the trading for the year 1914 is a credit balance of £35,397, plus £5,128 brought forward. Directors' remunerations, voted March, 1914, absorbs £1,000, and directors' expenses £59, interest at 4½ per cent. on first mort. debenture stock £4,250, interest at 5 per cent. on second mort. debenture stock £3,712, written off investments £2,139, leaving £29,364. After deducting £4,000 as appropriation for payment to trustees of second mortgage debenture stock, it is proposed to pay a dividend of 5 per cent. on the cum. preference shares (£100,000) to 31st December, 1914, less income tax £4,615, to transfer to first mortgage debenture redemption fund £2,500, to pay a dividend on ordinary shares (£114,850) at the rate of 5 per cent., less income tax, £5,300, to transfer to reserve fund £5,000, and to carry forward £7,950.

After making the above appropriations, the redemption fund for the first mortgage debenture stock will stand at £38,000, the redemption fund for the second mortgage debenture stock at £32,000, and the reserve fund at £30,000, making a total of £100,000. The application of the Manchester Corporation to Parliament for power to purchase the business of the Trafford Power & Light Supply (1902), Ltd., was not sanctioned.

Annual meeting, March 15th.

Newcastle-upon-Tyne Electric Supply Co., Ltd.

THE directors report that the connections to the company's system at the end of 1914 amounted to 231,425 H.P., an increase of 27,757 H.P. The profit for the year is £178,380, compared with £141,140, plus £6,589 brought forward, making £184,969. Interest on debenture stocks, loans, etc., absorbs £52,564, leaving £132,405. The dividend on the 5 per cent. preference shares requires £45,589, as compared with £34,375. A dividend of 3 per cent. on the ordinary shares, making with the interim dividend of 2½ per cent. 5½ per cent. for the year, requires £43,870. There is to be transferred to depreciation account £20,000, as against £15,000; £17,000 is to be put to reserve (as compared with £10,000 last year), of which £7,000 is to be treated as a further provision against possible loss on realisation of the company's investments, and £10,000 transferred to reserve account, and £5,946 is to be carried forward. The reserve now stands at £10,405, out of which the directors propose to write off part of the remaining cost of the issue of second mortgage debenture stock, £10,000, leaving in reserve account £405. The unappropriated depreciation account becomes £153,900, which is in addition to the items of £170,000 and £8,600 specifically allocated in the balance sheet. The company's plant and system have been efficiently maintained out of revenue, £74,571 having been spent thereon. The additions to capital expenditure account for the year amounted to £129,590, and represent part of the cost of extensions in progress at the Carville and Dunston Power Stations, and also to the company's general distribution system. The sub-division of the company's £5 shares into shares of £1 each was carried out during the past year.

At an extraordinary general meeting held on the 31st March last, the company's share capital was increased by the creation of 165,000 additional preference shares of £1 each, and 165,000 additional ordinary shares of £1 each, in order to acquire the shares of the County of Durham Electrical Power Distribution Co., Ltd.

An offer was sent out to the shareholders of the Durham Co., inviting them to exchange their shares for shares in the Newcastle Co. on the terms agreed, and acceptances of this offer have been received from all shareholders excepting four, whose total capital holding represents £400. Certificates for Newcastle Co.'s shares have now been issued against all shares so exchanged.

In response to appeals for assistance, on the outbreak of the war, a contribution of £200 has been made to relief funds, and the confirmation of this by the shareholders will be asked for at the general meeting. The shareholders will also be asked to express an opinion as to whether a further amount should be placed at the disposal of the directors to meet other claims for assistance.

Annual meeting, March 16th.

Para Electric Railways and Lighting Co., Ltd.

DURING the year ended November, 1914, the company had to contend with great difficulties due to the rubber crisis and stagnation of trade in the Amazon Valley, the further depression caused by the outbreak of the war, and finally the fall in Brazilian exchange, which for many years had been steady at the legal gold rate of 16d. per milreis.

In consequence of these adverse factors the gross receipts decreased from £299,924 in 1913 to £249,891 in 1914. By close attention to economies on the part of the local management, the operating expenses were reduced from £164,261 to £132,491, the net revenue earned in Pará being, therefore, £117,400. As the accounts are based upon the legal exchange rate of 16d. per milreis, there must be deducted £5,914, being the actual loss incurred on remittances, and after providing also for the London expenses the balance of operating revenue is £106,147 compared with £128,857 in the previous year. Adding £777 interest and transfer fees received, and £19,206 brought forward, the total was £126,130, from which the debenture interest and sinking fund of £38,500, and the interim dividend paid on the preference shares, £9,600, are deducted, leaving £78,030. There is to be transferred to depreciation and renewals reserve £15,000, to contingencies reserve £10,000, a final dividend of 3 per cent. on the preference shares for latter half-year (making 6 per cent., less income tax, for the year) absorbs £9,600, a dividend of 6 per cent., less income tax, on the ordinary shares for the year requires £23,400, and £20,030 is to be carried forward.

If the rate of exchange should remain at a figure below 16d., it will be necessary to adjust the value of local accounts. This is sufficiently provided for in the contingencies reserve, which has a credit balance of £50,522. In August last, when an interim dividend on the ordinary shares would have been declared in the usual course, the directors considered it unwise to reduce the cash resources of the company in London as the general financial position was universally disturbed, exchange was low, and the difficulty of making remittances from Brazil was almost insuperable. All these conditions have since improved. During the year the capital expenditure amounted to £5,828, mainly for extensions to the lighting system. By an active campaign for new business, the number of lighting consumers has been increased, although the consumption of lighting current has fallen off on account of the domestic economies obtaining.

The sum of £5,609 charged against renewals represents the cost of completing the renewal of the underground cable system. The balance to the credit of the renewal fund amounts to £81,545.

1913.		1914.	Per cent.	
23,254,258	Passengers carried	19,339,989	Dec.	16.8
3,172,069	Car miles run	2,974,422	Dec.	6.2
3,890	Consumers connected	3,951	Inc.	1.6
2,371,997	Units sold for lighting and power ...	2,430,734	Inc.	2.4

The directors report the death of Dr. Lucio F. do Amaral, director in Pará.

The annual meeting was held on Friday at the Cannon Street Hotel, E.C. Mr. F. HOLT, who presided, said that there had been a reduction of £50,000 in gross receipts, brought about by a falling off in the number of passengers, by a mere economical use of electricity by private consumers, and by the reduction made voluntarily in the rates charged to the municipality for public lighting. Against this loss they were able to set off a reduction of £32,000 in the Pará expenses. A sum corresponding approximately to the reduced car service was saved in tramway maintenance, and a saving of over £7,000 in the maintenance of the electric lighting installation was also made possible by the completion of the renewal of the old and obsolete underground cables, which were very costly to repair, and other economies were obtained through the reorganisation of the staff and by the fall that had occurred in the local value of all labour. It was possible that some shareholders might think that rather than reduce the ordinary dividend they should have reduced the carry-forward or the allocation to the funds, but with this view they could not agree. Not only the cash position of the company called for prudence, but they must bear in mind that there were important factors in the business at the present time which were entirely outside of their control, and they therefore had no hesitation in asking them to confirm the reduction from 10 per cent. to 6 per cent., which they proposed as the dividend on the ordinary shares. Considering the unprecedented conditions of business throughout the world, a 6 per cent. dividend well and truly earned was not to be despised, and if any of

them considered that the board had erred on the side of caution, then the money retained was safe and sound in the business and must come into their hands in good season. Having referred at some length to the condition of the rubber industry in the Amazon Valley and expressed the opinion that although it might be hampered at present it was not likely to be lost to the country, the Chairman said that the rate of exchange was the matter which concerned them more than anything else at the present time. At the outbreak of the war, when Brazil decided to fund the interest on her public debt payable in Europe, it was generally expected that this would have a favourable effect upon exchange and that the milreis would be maintained at or near 16d. The fall to the neighbourhood of 12d. had been a great disappointment to all the friends of that country, and might force them later on in the year to consider whether they would be justified in paying an interim dividend on the ordinary shares, or whether it would be again wiser to wait the result of the working for the full year before considering the ordinary dividend. Their position in Pará was being watched with the greatest care, and every effort was being made to work as economically as possible. The fall in the price of local labour had enabled them to change from coal to wood fuel in the power house, and they were effecting a very material reduction in the expenses at the present time on this account, which would help them to meet the reduction they were experiencing in the tramway traffic and the loss due to exchange. Strenuous and successful efforts were also being made to encourage the use of electricity for commercial and domestic purposes in Pará, and these efforts were undoubtedly helping to maintain the revenue on the electrical side of the business. They had been approached by the directors of the gas and telephone undertakings in Pará, which were operated by two English companies, with a view to some arrangement for future management. Those were much smaller concerns than their's, and they found in these bad times that the cost of their administration weighed heavily upon them. They both had to consider whether it was better for them to reduce their personnel, which would lead to a less efficient service to the public, or to maintain the efficiency of their service by combining their administrations with theirs and reduce in this way their operating costs. The services which the Pará Co. gave to the public were, they believed, quite satisfactory, and it was to the general interests that the telephone service and the gas service of the town should be maintained on the same level. That was the spirit in which they were approaching the negotiations they had in hand, and if they were able to complete them they felt sure that the city and all concerned would benefit.

Mr. E. C. Cheston seconded the motion.

The Chairman, in reply to a shareholder, said that except immediately after the outbreak of the war they had not found any difficulty in obtaining remittances from Brazil. The suggestion that they should remit their takings in the form of produce instead of gold was not a feasible one, as it would be too much like speculation.

The report was adopted.

Telegraph Construction and Maintenance Co., Ltd.

The annual meeting was held on March 4th at 38, Old Broad Street, E.C., the Earl of Selborne, K.G., presiding. The Chairman said that they would be struck by the great similarity between the accounts of this year and the two previous years. They showed that when the plant which belonged to the company was fully employed under normal conditions the results had a tendency to repeat themselves. In referring to the times having been normal, he did not forget that nearly six months of the period under review had been passed under the wholly abnormal conditions due to the war; but owing to the protection of the Navy they had been able to pursue the trading operations of the company under conditions which might almost be described as normal. How wonderful the protection of the Navy was many of their fellow countrymen did not fully realise, because they could not have its doings as frequently and as intimately painted for them in the daily press as were the doings of the Army. In some respects, indeed, he thought the operations of the Navy had been too successful, because owing to the protection it afforded the country many people wholly failed to realise that we were still in the unfulfilled crisis of the greatest war of our history. The conditions of life in the country had been too normal—business should not proceed "as usual," but should be carried on with the war in view. He was glad to say that the company had contributed to the fighting forces of the King. About 170 members of the staff and employés were taking an active part in the war, but their praise should not be confined to those who were fighting, because those who had stayed at home—many of them reluctantly—were contributing to the success of the country no less than those who were engaged in the fighting. Special praise and thanks were due to those who had remained at home as well as to those who had joined the forces. The fact that many had gone away had meant increased strain and responsibility on those who had remained at home. He thought it was greatly to the credit of the staff that they had been enabled to produce such satisfactory results. They had treated those men who had gone away with the same patriotic liberality as most companies. It would be idle to conceal from themselves that there were no difficulties in front of them. Nobody could say how long the war was going to last. He was not one of those who thought it was going to come to a speedy termination; he believed we still had a long and arduous task in front of us, and that we were by no means past the crisis of our fate. Difficulties in the supply of labour must manifest themselves not only in their own works but in the works of those who supplied cables. There were also difficulties of transit; but he sincerely trusted that those difficulties would not be increased by any differences of opinion between employers and employed, either in their own business or in any of the businesses upon which they depended. He did not think those difficulties could possibly arise if people really understood that the issue of the war was still in doubt, and that the crisis of our fate as an empire was not past. As a race we were singularly devoid of imagination—we could not see what we did not understand, and he thought the Government and the Press were somewhat to blame in the matter, because he thought the general colour given to the published reports was too favourable. Nobody who had no means of inside information would think that in this war we had had any set-backs at all. Coming back to their own company, it was interesting and encouraging to note that the shares were quoted at a higher figure to-day than they were when he became chairman five years ago, and he did not think they could have a greater proof of the solidity, stability and honesty of the business.

Sir James Pender, Bart., seconded the motion, which was carried unanimously.

Kensington and Knightsbridge Electric Lighting Co., Ltd.

Col. R. E. Crompton, C.B., presided, on March 4th, at 148, Brompton Road, S.W., over the annual meeting. He said that in the first six months of the year they had to face loss of revenue due to the closing of the museums on account of the Suffragette outrages, and again, the strike in the building trade adversely affected the supply of electric power to this trade, and then they had the coal porters' strike, which increased the cost of coal. Still, by care and economy, and by a small increase in the selling price, they were in a fair way of showing slightly increased profits. Then came the war, and consequently heavy loss of revenue and loss of efficiency due to a number of their staff being called away. The reduction of output realised by the end of the year was about half a million units, which was 7½ per cent. of their output, but on account of their slight increase of price the loss in money earning was only 6½ per cent., as their increase in average price per unit had been rather less than ½d. per unit. On the other side of their balance sheet they had effected notable savings, viz., in the case of generation and distribution £3,600, or 11 per cent.; in repairs to plant £812, or 11½ per cent.; in management £792, or 12¼ per cent. But against these savings there had been increases in items over which they had no control, such as rates and taxes. The net result has been a total saving on the costs side of £4,717, which so nearly reached their loss in revenue that they had been enabled to recommend the payment of their dividend of 9 per cent. for the year. It was unwise to prophesy, but they hoped that the loss of revenue caused by the war would gradually right itself. At the outset their customers very naturally economised in their lighting bills, and many of them remained in their country residences during the autumn. Again, the enforced darkening of the streets, of which they could not complain, would probably in the future not affect them so much as it did during November and December—the time when shop display had ordinarily a very good effect on their revenue—as now owners of shops who relied on display by artificial light were gradually finding means of improving the lighting of their interiors. They were not so anxious as they were, but he hoped the shareholders would realise that they owed their comparatively satisfactory financial results to the extraordinary hard work and devotion of their managing director, Mr. Miller, and the staff, who had worked long hours to obtain the economies he had mentioned and to supply the place of those called away for war purposes. As both the Parliamentary Bills which would have affected their interests very considerably had been withdrawn, he did not propose to say very much on the matter, which had been so greatly discussed in the Press. The London County Council Bill which offered the companies terms of absorption which would have warranted their most careful consideration, had been withdrawn, and the Companies' Bill, which was intended to some extent to supplement the L.C.C. Bill, had been withdrawn at the request of the Government. Their board had co-operated with the boards of the majority of the London companies in discussing these Bills in a manner which they considered wholly satisfactory, and which they believed would be continued if further contingencies of the same class arose. So much had been said in the Press and elsewhere by those advocating gigantic schemes of electric supply for London that he would take that opportunity of pointing out to the shareholders that most of the promises made by the advocates of these schemes were not true in the one important matter, that they promised reductions of price for electric supply which could not be realised; at any rate, so far as they affected the majority of their customers who lived in the residential districts. London had been most unfairly compared unfavourably with New York,

Chicago, Berlin, and other great cities, but in these cities the total cost was shown to be that of the average supply, and included the supply to railways, tramways and the vast system of power of the industrial districts. This enabled them to show a lower total average cost than in London, where the bulk of the supply still was for lighting purposes. The directors had been for years past fully aware that the only chance of reducing the average cost to their customers in these residential districts was by extending the use of electricity for purposes other than lighting. The board and management had laboured unremittingly in this direction, and the special department appointed to foster this branch of their output had made continuous progress, particularly during the past year. The general public, who in most cases were the users of electricity mainly for lighting, and up to the present to a small extent for cooking and heating, ought to know that the cost for all these purposes charged by the company had been carried out to a point far lower than that of the large cities he had named. Although it was obvious that some amalgamation of generating stations would lead to small reductions in the cost of generating taken by itself, yet the total cost of electric supply, including the many charges dealt with in their balance sheets, would not be sensibly affected. The board regretted the resignation of Mr. R. W. Wallace, who had been a director since the formation of the company. His place had been filled by the appointment of Mr. H. W. Miller as managing director, and he hoped that they would consider that the economies which had been largely effected by the staff, had justified the board's policy in this respect.

Sir H. Bliss seconded the motion.

Mr. Whitworth said with reference to the reduction of repairs, he would like to know if there had been any tendency to let the plant down in any way. As regarded cooking, he said that the Barnes local authority were actually putting electric appliances into workmen's houses, and he wanted to know if the board could give any information as to the real progress by the company in supplying for cooking purposes.

The Chairman said the board believed the plant was in better condition than any plant in London. Although there had been a reduction in the cost of repairs that year the plant was certainly in as good, if not in a better, position than last year. The installation of cooking and heating fittings into workmen's dwellings was a matter of great importance, but it did not affect their company much, as there were comparatively few workmen's dwellings in the district. What did affect them were the small households and the small shops, and it was to reach them that they started a special department; so as to bring home to them the advantages of electric heating and cooking. Progress was, however, slow, partly because unless people were experienced in its use, the apparatus was likely to break down. Still, the progress was steady.

Mr. Whitworth asked whether electricity stood as well in comparison with gas for cooking as it did for lighting purposes.

The Chairman said that, personally, he thought it did. Far greater savings were obtained than the householders as a rule realised.

The report was adopted, and the retiring directors were re-elected.

Underground Electric Railways Co. of London, Ltd.

The annual meeting was held on March 4th at Westminster Palace Hotel, Sir Edgar Speyer, Bart., presiding. The Chairman said that considering the period of exceptional anxiety and trouble, which so unexpectedly came upon the country last August, he thought the results achieved were satisfactory. It would, however, be idle to deny that he was disappointed that the hopes he expressed last year had not been entirely realised, although the reasons which militated against a more favourable showing were entirely beyond the control of the management. It was not necessary to deal in detail with the operating results of the various companies in the securities of which the Underground was so largely interested. At the outbreak of the war it was felt that no new expenditure should be undertaken for the moment by those companies, and therefore the important works to which reference was made last year should be postponed. Chief among these were the Hammersmith widening, a further arrangement of moving staircases, and the Euston and Camden Town extensions on the London Electric; certain improvements, such as the widening of the tunnels at Holborn, and the installation of escalators at Shepherd's Bush, Oxford Circus, and the Bank on the Central London Railway. The Wood Lane extension, which would connect the Central London with Ealing, had made only slow progress. The same policy had been pursued by the District Railway, which had been taken over by the Government, and which had postponed all new contracts for works that were not absolutely necessary. As regarded the City and South London Railway, the construction work in connection with the widening of the tunnels had not been started. Those postponements were bound to delay the development of the properties and to some extent retard the improvement in their earnings. At the same time he was pleased to be able to tell them that the Queen's Park extension, opened about a month ago, already showed encouraging results. While the war had thus arrested necessary developments, it had had other indirect and unfavourable consequences. The price of coal, which was an important factor in the operation of those railways, had risen very considerably. The prices of other materials had shown the same upward tendency. This had been felt particularly severely by the railways, which had so far worked on a very narrow margin, and the dividends—none too large in the past—had had to be further curtailed. The distributions for the year in the case of the District II. preference stock amounted to 2 per cent. against 2¼ per cent. last year; in the case of the London Electric ordinary ⅝ths per cent. against 1 per cent.; in the case of the Central London Railway ordinary 2⅝ per cent. against 3 per cent. As regarded the London General Omnibus Co., the Chairman had explained that the Government had taken over a large part of that undertaking for war purposes, and he pointed out that the figures in the company's accounts did not allow for any sums which might hereafter be received from the Government. He had further informed the shareholders that the War Office continued to take 'buses for transport service abroad, and that until some definite understanding with the Government had been reached regarding the terms of payment for the use of the London General Omnibus property it would be premature to go into any details. The London & Suburban Traction Co. began last June to pay dividends on its ordinary shares at the rate of one per cent. per annum, but owing to the adverse effects of the war the company was not able to make any further distribution. The dividend on the preference shares, however, had been paid in full. There remained the Associated Equipment Co. That company had further developed and shown satisfactory results. It was making extensions and increasing its plant to cope with the additional work thrown upon it, and it was hoped that it would continue to show good returns, although the increased price of materials which was being witnessed everywhere now was a factor which might somewhat affect the results. The revenue account showed that the income from investments, etc., amounted to £684,625; an increase of £54,809. Taking the results as a whole, and bearing in mind the exceptional circumstances under which the companies were worked for the latter part of the year, the Underground had again demonstrated its vitality and afforded proof that in normal times it could count on increased prosperity. Its subsidiary companies performed an indispensable service to London, which was rendered in the most efficient manner. For the excellence of this service they were indebted to the staff of the various companies, and foremost among them to their managing director, Sir Albert Stanley.

Lord Farrer seconded the motion, which was adopted without discussion.

Charing Cross, West End and City Electricity Supply Co., Ltd.

The annual meeting took place on March 4th at the offices, St. Martin's Lane, W.C., Mr. W. F. Fladgate presiding. The Chairman said it had been his usual custom in each year to compare the accounts under consideration with those of the preceding year, but the circumstances of the past year were so abnormal that any such comparison would be quite valueless. As regarded the West End areas, the gross earnings had decreased some £9,153 and the expenses had increased £2,811, making the net earnings for the year £72,409, or a decrease of £11,964. In July last an interim dividend at the rate of 5 per cent. per annum was paid on the ordinary shares, and as a dividend at that rate could be paid out of the available balance without in any way touching on their reserves or the carry-forward of last year, the board had considered that it was quite justified in recommending a dividend at that rate, carrying the small balance of £304 to general reserve (income account), which would then stand at a little over £7,000. They carried forward on revenue account the £18,000 brought forward from last year, and this, with the £7,000 on general reserve income account, gave them a round sum of £25,000 to fall back upon in aid of the profits for the current year. Their depreciation fund would stand at about £150,000. As regarded the City undertaking, the gross earnings, notwithstanding the war, were slightly higher than last year, but, owing to the increase in expenses, the net earnings were £2,474 lower, the net total being £66,706. This, after payment of all interest, provided £36,367, out of which to meet the preference dividend of £18,000. They were therefore able to carry forward £18,000, the amount brought from last year, and by transferring the balance, £18,367, to general reserve income account, this would amount to the sum of £71,515. It was not proposed to deal at present with this account, nor, as explained last year, to write anything off for depreciation. There was one item on the balance-sheet to which, perhaps, they would think he ought to refer, and that was "Investments at cost." Having regard to the depreciation caused in most securities by the war they might naturally enquire as to whether these ought to remain at the same price. As, however, the whole of these investments were purchases in their own debenture stocks, there was no necessity in any way to write them down. The increase in the cost of materials and labour had been very great. For instance, the average price of coal had increased some 13¼ per cent. over last year, but he was happy to say, thanks to economies in working, their works costs at Bow had increased less than 4 per cent., while transmission losses had been considerably reduced. The increase in the price of coal was giving them anxiety, and should it continue there would be no alternative but to increase the price of current, a course which they would only adopt if absolutely necessary. He need hardly

tell them that their business was seriously affected by the lighting restrictions. In January of this year their output was reduced by 14 per cent. in the city, and 20 per cent. in the West End, and these reductions must affect their revenue. No less than 77 of their staff had joined the colours, and the board, considering it their duty to make some provision for their dependents, were now paying at the rate of nearly £3,000 a year on this account. Last year he called their attention to a scheme which had been put forward to acquire the shares of the electric lighting companies of London and to expend a very large sum of money in building a new generating station with necessary connecting mains, etc. The board did not think the scheme was one which they could support, and a committee representing the majority of the London companies, after consulting engineers of the highest standing, agreed in their view. The scheme was shortly afterwards withdrawn. The London County Council had appointed a special committee to deal with this question, and in the autumn of last year a conference took place at which there was an interchange of views. They pointed out (as they had always done) that in the view of their engineers a gradual change was the only economical and wise course to be pursued, and that they were quite willing on fair terms to co-operate. In the result, a Bill was introduced by the London County Council, which, however, owing to the want of support by the full Council, had to be dropped. There was, therefore, no object in troubling them with any details of that Bill, beyond stating that in many respects its provisions did not commend themselves to the board. Their committee also introduced a Bill, but, having regard to the decision of the Government that no contentious business should be taken, this had been withdrawn. The committee of the companies had still been kept alive. In their view discussion among themselves and with the London County Council, and possibly the local authorities, could not but be useful, and if and when a scheme could be arrived at they would put it before the shareholders for their consideration. He and his colleagues had in no way altered their view that so far as their company was concerned they were quite content with their present position, and felt convinced that they could continue properly to fulfil the obligations imposed upon them under their provisional orders and to safeguard the interests of shareholders. At the same time, they were quite prepared, provided they were fairly met, and provided the consideration to be given to them was a fair and reasonable one, to advise the sale of their undertakings to the County Council. The Council must, however, be prepared to treat them generously and admit that the price which they were entitled to ask to-day was very different to that provided under the Acts under which their original Provisional Orders were issued. They did not admit for a moment, however, that under existing conditions (for which they were in no way responsible) London was badly served. In his view the only way in which real progress would be made would be if the Council would authorise their committee to meet that of the companies and discuss the whole question freely and unreservedly. He could not conclude without referring to the very serious times in which they were living, the seriousness of which, he thought, was only now being sufficiently appreciated. In referring to these times and the difficulties under which they were working, he felt they owed a debt of gratitude to the whole of their staff for the work which they had done, and were now doing. They must thank those who joined the colours for their patriotism, and equally thank those who had remained with them, and who had enabled them to meet the very serious position in which they were placed by the conditions under which London lived. They did not criticise what was done—they were content to believe that it was done for the best. There might be many dark days before them yet, but let them hope that the not very far distant future would bring brighter times, when the war drum would throb no longer and the battle flag would once more be furled. The pressure upon their business might be severe and the decrease of their profits serious, but they knew that it was entirely and wholly due to passing causes. The earning power of the corporation was in no way impaired, and they saw no reason why they should not look forward to the future with every feeling of confidence and hope.

Mr. J. M. Gatti (managing director) seconded the motion, and the report was adopted.

The retiring directors were re-elected, and, on the motion of Mr. Surrage, a hearty vote of thanks was passed to the directors and staff.

British Engine, Boiler and Electrical Insurance Co., Ltd.

The annual meeting was held at 24, Fennel Street, Manchester, on March 5th. According to a report received, Mr. R. C. Longridge (the Chairman) directed attention to the fact that the business was steadily expanding, the increase in revenue for the past year, as compared with 1913, being £6,625, equivalent to 6 per cent. It was pointed out that this expansion did not involve any deterioration in the quality of the business transacted, as the increased revenue was accompanied by a corresponding increase in the balance of profits, notwithstanding that the company had to meet several heavy claims in respect of breakdowns in the engine and electrical departments. The public, perhaps, did not even fully realise that although the primary function of an engineering insurance company was to make inspections and ensure safe and economical working, the company also undertook to indemnify power users in respect of material loss. It was reported to the meeting that nearly 28 per cent. of the eligible members of the office staff had joined H.M. Forces, the company taking its share of the patriotic burden by paying full salaries to the absent members and keeping open their places. In connection with the war, it was also reported that the company had been entrusted with the work of inspecting certain kinds of war material ordered from contractors. If this procedure were universally adopted the result would be advantageous to the national interests.

Metropolitan Railway Co.

The Rt. Hon. Lord Aberconway presided on February 25th at the offices, Baker Street Station, over the annual meeting. Having dealt at some length with the arrangements made by the Government with the companies, by which he considered the Metropolitan Co. had rather lost than gained, the Chairman gave particulars of some of the special work that their company had been called upon to do in the carrying of troop trains and goods trains. Notwithstanding all this extra business they had managed to keep their ordinary services running except on one or two days of exceptional pressure, and the fact that they had done this on a line that was normally one of the busiest in the country, and had done it without any mishap of any kind, afforded striking evidence of the completeness of their safety appliances, and reflected no small credit upon the officials and staff of the line. Their staff had been considerably depleted by men joining the colours. About 430 men had responded to the country's call, and seven had already fallen on the field of honour. The accounts as presented showed that the net receipts for last year, after taking into account the amounts received or receivable from the Government up to the end of December, showed an increase of £25,300, due mainly to the fact that they included a full year's takings of the Great Northern and City line, as compared with only six months of 1913. Their rents showed an increase of £6,000, which they would regard as exceedingly satisfactory, especially in view of the bad times through which they were passing. On the other hand, they had to meet increased charges in respect of the new debenture stock and loans they issued a short time ago, amounting to about £22,000, whilst their interest charges for money borrowed from the bank, etc., amounted to an extra £10,000. In 1913 they commenced to form a new reserve fund for general renewals, and placed to that fund £7,500 out of the revenue for 1913, and £5,000 which they had in suspense in respect of permanent way renewals. They proposed on the present occasion to credit that fund with a further £12,500, which was an increase of £5,000 over the amount taken out of the 1913 figures, and after doing this there was a balance left for dividend on the ordinary stock of £92,000, as compared with £113,000 in 1913. Of this amount £48,490 was absorbed by the payment of the interim dividend at the rate of 1½ per cent. per annum in August last, and the balance would admit now of a further dividend at the rate of 1 per cent., making 1¼ per cent. for the year, and enable them to carry forward £11,458, as against £8,258 twelve months ago. He was afraid there had been some misapprehension in the minds of the public as to what the Government guarantee amounted to. It had been stated that the Government had guaranteed the several companies' dividends, but this was not the case. What they had guaranteed was a certain income from certain sources reduced in a way that he explained. They had not guaranteed their net income, out of which the dividend was paid, and it therefore followed that they had not guaranteed the dividend itself. They thought it wise on this occasion, and having regard to the difficult times through which they were passing, to follow the example of other companies and to adopt a conservative policy in dealing with the revenue, and in this connection he reminded them that in the matter of reserves the company was in a stronger position to-day than it had ever been hitherto. Their electrical renewals and depreciation fund stood at nearly £67,000, the general renewals fund at £25,000, and the general reserve fund at £60,000. In December last they made an issue of £500,000 five per cent. preference stock at the price of 99 per cent., and the money was payable by instalments during the current half-year. This issue was required in order to repay temporary loans from the Bank and to provide for capital expenditure that they had in prospect. The new sub-station at Drayton Park had been completed, and since September last they had been supplying current for that section of their line from their power station at Neasden. By this means they had effected a very handsome saving in the cost of working that line, and it would interest them to know that the estimate made by the general manager at the time of the purchase of the Great Northern and City Railway of the savings that could be effected by their working it had been fully justified by the actual facts. The saving estimated was £12,000 per annum, and to-day they were actually saving at the rate of £11,900 per annum, in addition to which there would be the rent of the disused power house on the Great Northern and City Line as soon as they succeeded in letting it. The new stations at Goldhawk Road and Uxbridge Road on the Hammersmith and City Line were attracting a considerable amount of new traffic, and the escalators that had

been put in at Baker Street to connect their station with that of the Bakerloo had largely increased exchange traffic at that point. The only section of the widening between Finchley Road and Wembley not yet completed was the viaduct at Kilburn. The contractors were pushing on with the work of constructing the new viaduct as quickly as possible; but there was a very serious shortage of skilled labour in the steel trade just at present, and the completion of the work was being delayed in consequence. They hoped, however, to be in a position to open the widening throughout in the coming summer. He had already referred to the extra work thrown upon the company in consequence of the war, and he would like to say how much they appreciated the way in which it had been handled by the staff. In view of the increase in the cost of living, an arrangement had been made by the companies generally under which the men were to be paid a weekly bonus to supplement their wages during the continuance of the present arrangement with the Government. The extra cost involved in this payment was one that, under the terms of their arrangement with the Government, they should bear, and although they had hitherto shown some hesitation in accepting that position, he thought there was no doubt they would eventually recognise that the payment came properly within the terms of their guarantee.

Sir Clarendon G. Hyde seconded the motion.

Mr. Pownall initiated a lengthy and somewhat heated discussion by attacking the board for their acquisition of what he termed the bankrupt Great Northern and City concern, and he also made a strong personal attack on Sir Clarendon Hyde, who, he said, was a partner in S. Pearson & Co., who owned the bulk of the stock of the Great Northern and City Railway. Mr. Pownall also attacked Mr. Belisha, who had been elected to the board, and declared that the shareholders were being exploited.

These attacks having been replied to, the resolution for the adoption of the report was put and declared carried by the Chairman.

The Chairman proceeded with the business of the re-election of the directors and auditors amidst considerable uproar and cries of "It was not carried."

Metropolitan Electric Supply Co., Ltd.

The capital expenditure at the end of 1914 totalled £2,228,459, an increase during the year of £56,123. A further amount of £18,632 3½ per cent. mortgage debenture stock was issued during the year. The gross revenue amounted to £215,544, a decrease of £2,061. The working expenses were £114,611, an increase of £3,294. The revenue for the first half of the year showed a satisfactory increase, but it was seriously affected during the last half by the diminution in lighting due to war conditions. That the net decrease was no greater is due to the large amount of new business obtained in the Western areas. The balance at the credit of the revenue account, before providing for depreciation, is £100,933. The directors have set aside £22,000 as an addition to the depreciation and reserve fund, which, after writing off certain items, now amounts to £532,745, carrying to the credit of the net revenue account £78,933, which, with the balance brought forward, interest and dividends on investments, and other receipts, makes a total of £90,485. After deducting interest on debenture stocks and loans, dividend on preference shares and other charges, there remains a balance of £38,795. As already announced here the directors recommend a further dividend of one shilling and sixpence per share (being at the rate of 3 per cent. per annum) on the ordinary shares, making a total for the year of three shillings and sixpence per share, or 3½ per cent. This will leave £3,795 to be carried forward. The report mentions the two London Bills that have lately been dropped for this year.

During the year new connections representing the equivalent of 51,666 25-c.p. lamps, equal to 1,550 kw., were added to the company's system, making a total connection at the end of the year of 1,138,496 lamps.

Annual meeting, March 16th.

Edison Accumulators, Ltd.

At the first annual meeting, which is being held in London to-day, the directors will submit their first report (for the period ended 31st December, 1914). This states that the work of the year has consisted largely of demonstrations, made in most of the important towns, with a view to bringing the vehicles equipped with Edison batteries to the notice of users of various classes. Although the results of this work will be apparent in future years, the directors have decided to write off the whole of the expenses thus entailed. Orders have already been obtained for upwards of 100 electric vehicles, and as the working results become better known it is confidently anticipated that large orders will result. Important establishments that have been testing delivery vans fitted with Edison accumulators have already been sufficiently satisfied with results to place further orders, and one London firm will shortly have over 50 of these vehicles in regular service. Electric trucks for the conveyance of materials and goods in works and warehouses are being tested by railway companies and others with satisfactory results. A tipping wagon to meet the requirements of the municipal authorities has been designed by the company's engineers, and orders for several of these have already been placed. A number of Edison accumulators have been supplied for automobile, omnibus, and yacht lighting, for which they are specially suitable.

Mr. Arthur L. Pearse, who was elected a director at the inception of the company, had to resign on account of ill-health, and Mr. C. W. von Roemer was elected a director in his stead.

The profit and loss account shows a gross profit from trading account, £8,980, and a net loss of £1,669, for the period.

Berlin Grand Tramways Co.

The report for 1914 of the Grosse Berliner Strassenbahn A.G., states that the traffic declined in the first seven months down to the outbreak of the war, as in the second half of 1913, in consequence of the extension of the Elevated and Underground Railway, the motor omnibuses and the municipal tramways, whilst in the later months the undertaking stood under the influence of the war and its effects upon the general economic situation. Although the early days of the mobilisation resulted in an increase in the traffic, the latter receded in the first months of the war by 13 per cent. as contrasted with the corresponding period of 1913, and by 15 per cent. in the month of December. On the other hand, the unexpected calling up of over 50 per cent. of the employés rendered it necessary for the company to at first reduce the mileage run by 25 per cent., as it was impossible to replace over 5,000 men at once. Several lines were entirely discontinued, but on those remaining the speed was increased and an additional number of trailers put in service, although the frequency of the services was curtailed by 50 per cent. A large number of the wives of employés at the front were trained as conductors—over 600—but the training of drivers was extremely difficult, as most of the instruction staff were also requisitioned by the military authorities. Nevertheless, it was eventually possible to lower the 25 per cent. restriction to 15 per cent., as compared with 1913, so that the services were equal to the traffic by the close of the year. The gross receipts amounted to £2,118,000, as against £2,288,000 in 1913, and the total expenditure was £1,300,000 and £1,342,000 in the two years respectively, the percentage of working expenses to gross receipts having risen from 58.64 to 61.37 per cent. last year. After making provision for depreciation and other charges, the accounts show net profits of £328,000 as contrasted with £468,000, and a dividend of 6 per cent. is proposed, as against 8 per cent. for 1913.

STOCKS AND SHARES.

Tuesday Evening.

Distinct improvement has taken place in Stock Exchange conditions. The change is marked more in the tone of markets as a whole than in the amount of business which comes into the House. But the latter has certainly improved during the last few days, and the disposition is to buy securities not only in the popular sections, but in some of those which have scarcely moved since the war broke out. The chief animation at the moment is in oil shares. Rubbers, however, are on the move. Many departments of the industrial section have cheered up. Under the Treasury regulations, jobbing is cramped, cabined and confined, so that a little selling or a little buying has an effect almost absurdly disproportionate.

The reason for this marked alteration is, primarily, the increased public confidence engendered by the steady passage of the Fleets up the Dardanelles. This has had the effect of bringing into the Stock Exchange some of the money hitherto locked up on deposit in the banks. United States advices, moreover, are cheerfuller, though this is not a point to be laboured, since the recovery in values on the other side of the Pond appears to have for its base a vague hope of early peace—a consummation as devoutly desirable as it is for the time being impossible of verifying, or to do more than hope for.

While affairs in the United States look better, those in Mexico are more than ever at sixes and sevens. The latest news is that the present so-called government is threatened with an army marching against it from the North. In the circumstances, therefore, it can be well imagined that the speculator may elect to put money into Mexican issues, but that the ordinarily-cautious investor eschews for the time being even those bonds which before the revolution were regarded as first-class.

Travelling further South, optimism again comes into play by reason of substantial recovery in the Rio rate of exchange. From 12¼d., the exchange rose sharply to 13 1-16d., and Brazilian Tractions responded with a further rally to 53. No appreciable change occurred in Rio Tramway bonds or others connected with this group, so far as quotations were concerned; but instead of there being free sellers in the market, the position swung round to the sellers holding back and buyers revealing themselves more plainly than they have done for some time past.

At the meetings held so far by the London electric supply companies, the chairmen have naturally dwelt upon the difficulty surrounding deliveries of coal, which are more pressing than the matter of turning down London lights. The cry for Government intervention has so far evoked no sympathetic response, and the market for coal seems to be as strong as ever. The severity of the trouble may work its own remedy, because the worse the former becomes, the graver is the outlook for everything depending upon this source of heat. Oil shares, incidentally, have benefited by the jump in the price of coal, since it is assumed that when the Dardanelles are cleared and Russian oil supplies can flow freely through the Mediterranean, they will be eagerly taken for many of the uses for which at present coal is required.

Most of the figures are available in respect of the profits made during 1914 by the London electricity undertakers, and it is interesting to note how the comparisons come out against the figures for 1913. The following table analyses the results obtained by those companies whose figures are now published :—

	Gross profit. Inc. or dec.	Net profit. Inc. or dec.	Reserve. Inc. or dec.	Divd. (p.c) Amt.	Divd. (p.c) Inc. or dec.
Charing Cross	−£10,952	−£10,483	−£1,960	5	−1
Chelsea	+£210	+£210	+£379	5	same
City of London ...	−£9,190	−£8,858	same	9	−1
County of London	+£16,231	+£15,065	+£7,000	7	same
Kensington	−£1,204	−£1,011	+£729	9	same
London	+£21,406	+£20,668	+£14,000	4	+1
Notting Hill 1/- shares	−£296	−£325	+£57	500	same
St. James'	−£5,440	−£5,440	−£1,140	10	−2
South London	+£1,582	+£1,427	−£884	5	−½
South Metropolitan	+£1,485	+£1,862	same	nil	same
Westminster	−£3,787	−£3,712	+£535	9	1

The London Company, which shows the best figures of all, had the somewhat adventitious aid of a remunerative contract from the London County Council, in consequence of the Council's electric current failing for the tramway system. Next to this, the County of London makes the best showing, its figures exhibiting improvement all along the line. It is worth pointing out that out of the gross profit of £16,231, all but £1,256 has been retained in net—a striking testimony to the management of the company and to its powers for picking up more in one direction than it has lost in others. The reports have had the effect of strengthening prices as a whole, as will be seen from the accompanying sets of Stock Exchange quotations :—

Home Electricity Companies.

	Mean price. July 27, 1914.	Mar. 9, 1915.	Rise or fall this week.
Brompton Ordinary	9½	8⅞	—
do. 7 per cent. Pref.	8⅝	8⅝	—
Charing Cross Ordinary	5¼	4¾	—
do. do. do. 4½ Pref.	4¾	4⅝	+ ⅛
do. do. City Pref.	4⅜	4	—
do. 4 Deb.	91½	90	—
Chelsea	4⅝	4¾	—
do. 4½ Deb.	96½	99	—
City of London	16	14½	+ ½
do. do. 6 per cent. Pref.	13½	13¾	—
do. do. 5 Deb.	116½	113	—
do. do. 4½ Deb.	100½	98	—
County of London	12	11⅜	+ ⅛
do. do. 6 per cent. Pref.	12	11½	—
do. do. 1st Deb.	102½	99	—
do. do. 2nd Deb.	100½	97	—
Kensington Ordinary	7⅜	7½	—
London Electric	1 7/16	1 3/8	+ 1/16
do. do. 6 per cent. Pref.	5 5/16	5 1/16	+ 1/16
do. do. 4 Deb.	93½	87	—
Metropolitan	8¾	8⅜	—
do. 4½ per cent. Pref.	4 7/8	4	—
do. 4½ Deb.	97½	96	—
do. 3½ Deb.	83	80	—
St. James' and Pall Mall	9⅜	9 xd	—
do. do. do. 7 per cent. Pref.	7	6⅞	— ⅛
do. do. do. 3½ Deb.	84½	80	—
South London	3 1/8	3	—
South Metropolitan Pref.	1½	1⅜	—
Westminster Ordinary	8⅝	7½	— ⅛
do. 4½ Pref.	5¼	4⅞	—

Home Rails.

Central London, Ord. Assented	83	76	—
Metropolitan	37½	29	+ ½
do. District	21⅝	17	— ½
Underground Electric Ordinary	2¼	1⅞	—
do. "A"	7/8	6/-	—
Income	88	80½ xd	+ ½

Telegraphs and Telephones.

Anglo-Am. Tel. Pf.	108½	103½ xd	— ½
do. Def.	23	21½ xd	+ ⅛
Chile Telephone	7⅜	6⅝	—
Cuba Sub. Ord.	8½	8½	—
do. Pf.	16¼	15⅞	+⅜
Eastern Extension	19⅝	19⅝	—
do. 4 Deb.	97½	97 xd	—
Eastern Tel. Ord.	130⅜	127	—
do. 8½ Pf.	77⅛	73	—
do. 4 Deb.	96¼	94	—
Globe Tel. and T. Ord.	11⅜	11	+ ¼
do. Pf.	12¾	11⅞	+ ¼
Gt. Northern Tel.	32½	28	—
Ind.-European	59	51	—
Marconi	1 15/16	1 13/16	+ 3/16
New York Tel. 4½	101	97	—
Oriental Telephone Ord.	2 5/16	2	—
do. Pf.	1 15/16	1 3/4	—
Tel. Egypt Deb.	98	88⅜	—
United R. Plate Tel.	6⅜	6	—
do. Pf.	5½	5	—
West India and Pan.	1⅜	1 1/8	—
Western Telegraph	18⅝	18	—
do. 4 Deb.	96⅝	95½	—

Foreign Trams, &c.

	Mean price. July 27, 1914.	Mar. 9, 1915.	Rise or fall this week.
Anglo-Arg. Trams, First Pf.	4⅞	4½	—
do. 2nd Pf.	4½	3⅞	— ⅛
do. 4 Deb.	91	84	—
do. 4½ Deb.	98½	92	−1
do. 5 Deb.	96	88	—
Brazil Tractions	66	68	+2
Bombay Electric Pf.	11⅜	10⅜ xd	—
do. 4½ Deb.	96	91	—
Mexico Trams.	70	85	—
do. 5 per cent. Bonds	84	60	—
do. 6 per cent. Bonds	76	40	—
Adelaide Sup. 6 per cent. Pf.	5½	5⅛ xd	—
do. 5 Deb.	104	103	—

Manufacturing Companies.

British Westinghouse Pref.	1⅝	1 5/16	—
do. 4 Deb.	74½	72	—
do. 6 p. lien	102½	99	—
Callenders	11½	11⅜	—
do. 5 Pref.	5½	4¾	—
do. 4½ Deb.	98½	98	—
Castner-Kellner	2½	3 3/16	—
Edison & Swan, £8 pd.	3/32	14/6	+ 3/-
do. do. fully paid	1¾	2¼	+ ¼
do. do. 4 Deb.	59	65	+ 5
do. do. 5 % Deb.	63½	60	—
Electric Construction	17/32	13/-	—
do. do. Pf.	1 5/16	1	—
Gen. Elec. Pf.	10 3/4	10	—
Henleys	15	14	—
do. 4½ Pref.	5	5	—
do. 4½ Deb.	100½	97	—
India-Rubber	9	8⅜	—
Telegraph Con.	38½	37½	+ ⅛

The fall of 10s. in Westminsters is hard to explain, except on the ground that a seller who wanted to realise his shares found them difficult to place.

Remarkable activity has been displayed in the shares of the British Aluminium Company and in Edison & Swan. The former company is said to be doing extremely well from Government contracts for aeroplane work, and that the Ediswan is also making excellent progress is generally known. British Aluminium have been as high as 25s., coming back a little to 23s. 6d. Ediswan partly-paid at 14s. 6d. are 3s. higher, and the fully-paid 2¼ are 5s. better on the week. Manufacturing issues on the whole are strong. Telegraph Constructions have put on 10s., and there are buyers about both for Henleys and Callenders.

Home Rails are a trifle firmer. Underground Electric income bonds at 80¼ show a rise of ¾. Metropolitans firmed up to 29, but Districts at 17 are a dull spot.

The feature in the Telegraph section is a brisk rise in the price of Marconis. At 1 13/16 they are 3s. 9d. up, and, following them, the preference hardened at 32s. 6d. For these improvements the market has it the company is doing splendid business, which is probably the case. Moreover, there are buyers about. It is interesting to notice that the shares are within 2s. 6d. of their end-July quotation. Globe preference and ordinary are both 5s. harder, on the declaration of the usual dividends. Cuba preference, which had been unduly depressed, recovered just as suddenly as they were put down; and the few shares which, coming to market, had the effect of dropping the price violently, have been absorbed. The Anglo group is steady, and there is no change worth mentioning in the Eastern division. In the Armament section, the leading shares hold their prices with tenacity, and Vickers hardened a few pence. The rubber market, as already mentioned, is improving. Business shows a tendency to broaden, the demand coming from the provinces as well as from London. With the fear of Continental sales removed, through the rigour of the Treasury regulations, the market is inclined to take a cheery view of the outlook, and this disposition has been underlined by the quiet buying of the best-class shares.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Month ended (4 wks.)	Receipts for the month.		No. of weeks.	Total to date.		Route miles open.	Inc.
		£	£		£	£		
Bath	Feb. 24	2,468	− 455	8	5,025	− 569	..	..
Blackpool-Fleetw'd	Mar. 6	1,225	+ 4	9	2,818	+ 57	8	..
Bristol	„ 5	33,103	+3,575	9	75,492	+ 7,208	30·5	..
Chatham and Dist.	Feb. 25	3,805	+ 588	8	7,548	+ 1,975	14·98	..
Cork	Mar. 4	1,709	− 90	9	3,845	− 177	54·25	..
Dublin	Feb. 26	21,569	+ 507	8	44,640	+ 2,712	9·89	..
Hastings	„ 25	2,788	− 94	..	..	+ 107	19·3	..
Lancashire United	Mar. 3	6,088	− 164	9	13,421	− 197	42	..
Llandudno-Col. Bay	Feb. 26	727	+ 97	12	2,094	+ 262	6·5	..
Tyneside	„ 21	1,973	+ 24	8	3,881	+ 149	11	..
Anglo-Argentine	Mar. 4	201,740	−27,332	9	454,797	−28,851	..	..
Auckland	Feb. 12	19,912	−3,620	32	167,028	+ 7 988	25 42	1·03
Calcutta	„ 27	17,811	− 774	..	..	− 2,674	..	..
Kalgoorlie, W.A.	Dec.	2,905	..	52	31,824	..	..	..
Madras	Feb. 23	8,407	− 85	8	7,233	− 95	..	..
Montevideo	Feb.	30,007	−5,798	8	118,136	−19,765	..	..
Dublin-Lucan Rly.	Mar. 5	443	− 7	9	1,023	− 15	7	..

TRADE STATISTICS OF SPAIN.

The figures given below show the imports of electrical and similar goods into Spain during the year 1913, according to the official statistics recently issued. It will be observed that there is a predominance of German trade in practically every branch. The figures for 1912 are given for purposes of comparison, and notes of increases (which are very considerable) and decreases have been added :—

Arc lamps.—	1912. Pesetas.	1913. Pesetas.	Inc. or dec. Pesetas.
From Germany	157,000	90,000	— 67,000
,, France	25,000	18,000	— 7,000
,, Great Britain ...	10,000	83,000	+ 73,000
,, Other countries ...	10,000	11,000	+ 1,000
Total	202,000	202,000	—
Dynamos, electric motors, induction coils, resistances, transformers, etc., up to 400 kg. weight.—			
From Germany	3,692,000	5,269,000	+ 1,577,000
,, France	638,000	1,270,000	+ 632,000
,, Great Britain ...	568,000	967,000	+ 399,000
,, Switzerland	106,000	236,000	+ 130,000
,, Other countries ...	453,000	1,234,000	+ 781,000
Total	5,457,000	8,976,000	+ 3,519,000
Ditto, weighing from 401 to 2,000 kg.—			
From Germany	3,054,000	3,395,000	+ 341,000
,, France	299,000	786,000	+ 487,000
,, Great Britain ...	430,000	866,000	+ 436,000
,, Switzerland	281,000	463,000	+ 182,000
,, United States ...	397,000	890,000	+ 493,000
,, Other countries ...	155,000	508,000	+ 353,000
Total	4,616,000	6,908,000	+ 2,292,000
Ditto, weighing from 2,501 to 5,000 kg.—			
From Germany	496,000	749,000	+ 253,000
,, Switzerland	237,000	217,000	— 20,000
,, Great Britain ...	198,000	215,000	+ 17,000
,, Other countries ...	176,000	1,070,000	+ 894,000
Total	1,107,000	2,251,000	+ 1,144,000
Ditto, weighing more than 5,000 kg.—			
From Germany	4,026,000	5,634,000	+ 1,608,000
,, France	189,000	713,000	+ 524,000
,, Great Britain ...	165,000	266,000	+ 101,000
,, Switzerland	373,000	377,000	+ 4,000
,, Other countries ...	320,000	3,059,000	+ 2,739,000
Total	5,073,000	10,049,000	+ 4,976,000
Accumulators and electric batteries.—			
From Germany	104,000	60,000	— 44,000
,, France	79,000	66,000	— 13,000
,, Great Britain ...	7,000	104,000	+ 97,000
,, Other countries ...	30,000	43,000	+ 13,000
Total	220,000	273,000	+ 53,000
Cables and wires for electricity, with or without insulating material, of 1 cm. dia. or more.—			
From Germany	1,151,000	2,279,000	+ 1,128,000
,, Great Britain ...	645,000	1,096,000	+ 451,000
,, Other countries ...	249,000	362,000	+ 113,000
Total	2,045,000	3,737,000	+ 1,692,000
Ditto, less than 1 cm. in dia.—			
From Germany	122,000	296,000	+ 174,000
,, France	74,000	45,000	— 29,000
,, Great Britain ...	384,000	105,000	— 279,000
,, Other countries ...	14,000	39,000*	+ 25,000
Total	594,000	485,000	— 109,000

* Switzerland 2,400.

Telegraph and telephone apparatus, electric meters and parts.—			
From Germany	1,122,000	2,390,000	+ 1,268,000
,, Belgium	77,000	55,000	— 22,000
,, France	324,000	344,000	+ 20,000
,, Great Britain ...	204,000	677,000	+ 473,000
,, Sweden	119,000	90,000	— 29,000
,, Other countries ...	120,000	150,000†	+ 30,000
Total	1,966,000	3,706,000	+ 1,740,000

† Italy 83,000.

Carbons for arc lamps.—	1912. Pesetas.	1913. Pesetas.	Inc. or dec. Pesetas.
From Germany	94,000	102,000	+ 8,000
,, France	22,000	11,000	— 11,000
,, Great Britain ...	3,000	9,000	+ 6,000
,, Other countries ...	4,000	3,000	— 1,000
Total	123,000	125,000	+ 2,000
Electrodes.—			
From Germany	19,000	14,000	— 5,000
,, Italy	55,000	—	— 55,000
,, Other countries ...	16,000	15,000	— 1,000
Total	90,000	29,000	— 61,000
Incandescent electric lamps mounted.—			
From Germany	4,733,000	4,667,000	— 66,000
,, France	158,000	347,000	+ 189,000
,, Great Britain ...	334,000	63,000	— 271,000
,, Austria	466,000	158,000	— 308,000
,, Other countries ...	100,000	85,000	— 15,000
Total	5,791,000	5,320,000	— 471,000
Hydraulic motors.—			
From Germany	1,135,000	1,187,000	+ 52,000
,, France	127,000	244,000	+ 117,000
,, Great Britain ...	7,000	47,000	+ 40,000
,, Switzerland	278,000	829,000	+ 551,000
,, Other countries ...	16,000	5,000	— 11,000
Total	1,563,000	2,312,000	+ 749,000
Steam and gas engines (stationary) up to 10,000 kg. weight.—			
From Germany	559,000	555,000	— 4,000
,, Great Britain ...	708,000	784,000	+ 76,000
,, France	15,000	59,000	+ 44,000
,, Belgium	26,000	62,000	+ 36,000
,, Other countries ...	20,000	92,000	+ 72,000
Total	1,328,000	1,552,000	+ 224,000
Ditto, from 10,000 to 25,000 kg. weight.—			
From Germany	98,000	191,000	+ 93,000
,, Great Britain ...	25,000	153,000	+ 128,000
,, Belgium	27,000	71,000	+ 44,000
,, Other countries ...	85,000	40,000	— 45,000
Total	235,000	455,000	+ 220,000
Ditto, over 25,000 kg. weight.—			
From Germany	643,000	3,069,000	+ 2,426,000
,, Belgium	173,000	140,000	— 33,000
,, Great Britain ...	29,000	123,000	+ 94,000
,, Other countries ...	348,000	43,000	— 305,000
Total	1,193,000	3,375,000	+ 2,182,000
Cylindrical steam boilers.—			
From Germany	329,000	119,000	— 210,000
,, Great Britain ...	500,000	356,000	— 144,000
,, France	63,000	111,000	+ 48,000
,, Belgium	71,000	71,000	—
,, Other countries ...	25,000	1,000	— 24,000
Total	988,000	658,000	— 330,000
Multitubular boilers.—			
From Great Britain ...	2,944,000	2,835,000	— 109,000
,, Germany	652,000	733,000	+ 81,000
,, Belgium	165,000	328,000	+ 163,000
,, France	633,000	621,000	— 12,000
,, Other countries ...	168,000	64,000	— 104,000
Total	4,562,000	4,581,000	+ 19,000

Note.—25 Pesetas = £1.

Tungsten Wire Patents.—Some time ago five German firms opposed the grant, in the name of the A.E.G., of a patent concerning the manufacture of drawn tungsten wire for incandescent lamps, but they were unsuccessful. Since then the firms have proceeded further by attempting to obtain a declaration of nullity. The German Patent Office has now rejected these claims, and maintained the patent in the form in which it was originally issued. According to this decision, lamps with drawn tungsten wire, as at present customary, can only be made by the three members of the existing patent combine—the A.E.G., Siemens & Halske, and the German Incandescent Gas Light (Auer) Co.—and their licensees, of whom the Bergmann Co. is one. It is not improbable that in view of the importance of the question to lamp makers who are outside the patent combine, the matter will be brought before the Imperial Court.

TRAINING FOR THE INDUSTRIAL SIDE OF ENGINEERING.

The paper read by Mr. A. P. M. Fleming before the Institution of Electrical Engineers at Manchester was abstracted in our last issue; the following is a report of the discussion:—

Prof. Marchant said that it appeared a physical impossibility for a man engaged in manual or other labour during the day to study effectively and secure technical education during the evening. The Westinghouse scheme was to be recommended as affording men and apprentices an opportunity of gaining some knowledge during the day time of the theoretical technique of their profession. The statement made by the author that the fitness of a man for the profession of engineering depended upon his inherent characteristic could not be too strongly emphasised; not every student who entered a college for engineering training would necessarily make an engineer. Regarding technically trained students, the main point of importance was breadth of view rather than technical knowledge. After training in fundamental principles, if a man showed any capacity at all he might carry out some logical investigation on his own account. Specialised fundamental principles combined with a certain amount of research work would produce in the end a competently well-trained technical engineer. In the matter of training, a man's point of view was of much more consequence than the facts which he had accumulated. He supported the author's view that technical men should undergo college training before works training. A boy leaving school was far better able to take advantage of college training at once rather than after spending some time in the works. In electrical engineering, with its extremely difficult technique and the considerable amount of mathematical knowledge required, this system had certainly proved best in the speaker's experience.

Mr. H. M. Mensforth said that 5 per cent. clever mathematicians would permit them to get along very well. It was the remaining 95 per cent. that required consideration. Two important points for development in the student's mind were the power of observation and sympathy with the men he would have to control. The most difficult vacancies to fill were those in the works; commercial and designing engineers were easily obtained, but men with technical education and knowledge of how to deal with labour were very scarce. Technical colleges would do a good service if the opportunities of this side of the profession were pointed out to students.

Prof. Miles Walker said the efforts of the Manchester School of Technology were mainly directed to technical training, and there was a sufficient demand for it; hundreds of men were dealt with in the day classes; but thousands in the evening classes. Men who, year after year, after their day's labour, did really good honest work three evenings per week and home lessons on Saturdays and Sundays, must possess admirable qualities. It would require an exceedingly large institution to deal adequately with trade classes, but such were desirable, and preferably in the day-time. It was hardly fair to expect the manufacturer to put aside a great part of his works for the purpose of teaching apprentices; there ought to be a national system carried out in the same way as technical instruction for engineers. Such an institution would enormously increase the efficiency of the workmen. The effect upon the moral character of the men had also to be taken into account. If from the first an apprentice was placed under the influence of a teacher who dealt not merely with the technique of the work, but also with such aspects of moral character as controlled or affected the production of the work, it would be an enormous benefit. He agreed with the "college first" system. If possible, the student should have a year at the works, where he could be taught discipline and have to rough it with other workmen, but this year should be an extra, and should not be deducted from the subsequent college training.

Mr. J. L. Paton (Headmaster, Manchester Grammar School) said that every boy who started in the works should, if capable, have a chance of rising to the top positions. Statistics had shown in connection with the cotton trade that over 50 per cent. of the heads of firms and departments had risen from the ranks, and the vitality of our cotton industry was largely attributed to this fact. In the Navy every man was taught; even a stoker, signed on for a short period, was taught something about the running of engines and kept in touch with English literature. The result was that such a man could always find work on the termination of his period of service in the Navy. A wise man might lay down exactly on what lines a problem was to be solved, but its solution depended upon the hearty concurrence and co-operation of every unit concerned, and in the engineering trades these units included the unskilled labourer.

Mr. A. J. Cridge said discussion on this subject always brought out two lines of complaint: first, the superficially educated state in which young people of both sexes were allowed to leave school; and, secondly, the lack of co-ordination between employers, employés, and educational authorities. Modern methods would probably give better results in the near future. Co-ordination did not exist to the extent that it should between employers and educational authorities. He advocated the sandwich system of training. On account of the physical strain, works teaching was preferable to evening school work, and whilst nothing had been said about correspondence tuition, this would appear to demand more concentration than a young apprentice could give, principally because he had not been trained to give it. Whilst it seemed wrong to exalt the commercial man at the expense of the engineer without commercial experience, it was not right to despise commercial ability. It had been suggested as an argument against training apprentices in works that they moved to competitors who had the benefit of the training. The only reply to this argument was that an employer could not expect a man to serve him for life solely because he had trained him; the man must be properly paid to be retained.

Mr. Eustace Thomas thought that the two things insufficiently distinguished in technical training were understanding what was being done, and doing it. Ninety-five per cent. of the people in engineering work had to do things. Probably the quality which made a man a foreman or manager was his power of influencing other people and getting things done without disturbance. It seemed as though the more people studied, the more they killed off that power. He thought the problem would be solved by practical men getting in touch with the boys associated with the technical schools and working out means whereby the engineering instinct could be fostered at the same time as there was instilled sufficient technical training to make it useful all round.

Dr. G. W. Worrall said it was pleasing to note that the author regarded the character of the man as of at least equal importance to his skill, but, unfortunately, manufacturers did not exert themselves very much to maintain the high standard which they expected in their apprentices. It was to be hoped that the ideals set forward by the author would soon be accepted by firms, as a general complaint amongst university men was that their scientific knowledge was exploited by manufacturers and they were given work in the design office or on the test-plate where they would be most useful to the manufacturer without regard to their future. He had in the course of his business seen many youths quite unsuitable for engineering blocking the way of better men, and it was lamentable to see young men on the test-plate with ambition and ability to rise to the top, receiving less remuneration than labourers simply because, as one manager expressed it, the work was "unproductive." Schemes of education were useless if not accompanied by proper remuneration. Germany, with all its educational advantages, had tens of thousands of young men holding diplomas and university degrees who were draughtsmen in receipt of a mere pittance, and after hearing so much of Germany's fine system it was surprising to find how little the individual man benefited.

Mr. J. Collinge strongly advocated night schools, and considered that men willing to work all day and then attend school in the evening were men of character and likely to achieve success.

Mr. J. W. Lord said a junior technical school had been opened at Newton Heath, Manchester, to provide for boys of 15 or 16 who intended to enter some branch of the engineering trade. They would at first be artisans, but there was nothing to prevent their rising to the class designated as the "technical class." The difficulty of establishing trade schools was greater than was generally imagined on account of the great variation in trades in the district.

Mr. A. N. Howarth expressed admiration of the Westinghouse system and said that the boys were quick to appreciate the advantages which the present journeyman was unable to obtain in his apprentice days. In the case of apprentice draughtsmen, shop training was essential, and in later years this works training was reflected in the common-sense simplicity of their drawings. A point of advantage in the apprentice school was the close relationship between the management and the boys. Their different characters and temperaments could be studied with a view to their ultimate positions.

Mr. R. W. Paul (in a communication) said that the necessity for the better trade instruction of electrical craftsmen had long been felt and was emphasised by the present crisis; a good deal of the delay in supplying the needs of our fighting forces might have been obviated if such instruction had been systematically adopted in years past. Even in normal times there was no longer an adequate supply of all-round mechanics, like those of twenty-five years ago. Any person responsible for engaging mechanics for highly-skilled work must be impressed with the limited trade knowledge and abilities of the majority of applicants; on new and unaccustomed work expensive mistakes and wrong methods caused much economic waste. Generally the best craftsmen and most successful leaders had learned their business in small shops, where adaptability and all-round skill were required. The Westinghouse Co. was setting a splendid example to those firms who had not hitherto taken their full share in the training of the workers, on whom their success largely depended. The effort and expense, however, should be equitably distributed among all the firms of any given trade, since the benefits accrued to all alike. The initiative must come from the employers, as it did in earlier ages, but the co-operation of the educational authorities and trade unions might reasonably be expected. The latter might assist the movement by instructing ex-apprentices to prefer employment in those shops where the apprentices were properly instructed. Apprenticeship was necessary for the craftsman, as distinguished from the operator or machine-minder; the functions of technical

colleges and evening institutes, as at present constituted in England, bore little relation to the training of craftsmen. In his own works a shop had been equipped for instructional purposes, and the apprentices were no longer encouraged to attend evening classes. He hoped that the firms engaged in the electrical trade might soon confer together to promote definite and systematic trade training in their branches.

Mr. Fleming, in reply, said that a young man who had risen from evening schools had most excellent qualities. Unfortunately, the rate of educational mortality among evening men was fearfully high, the numbers at the start and finish being very different. The weeding-out of men unsuitable for engineering work was most important. Research work was excellent during training if utilised to develop the men along useful lines. He agreed as to the importance of getting sound men rather than highly educated men. Mr. Mensforth had spoken of the use of technically-trained men on the works side of the organisation. Such men were required to have sympathy with the workmen and to be able to understand and handle workmen. Possibly the man for the works was born rather than made. Really good men were wanted and there were excellent possibilities for the right men. The junior technical school was a promising movement, and another school was to be started at Openshaw (Manchester). The works school afforded an unrivalled opportunity of getting in touch with each boy in the works, of seeing his worth, encouraging him and giving him every opportunity to rise if he had the ability.

ELECTRICITY APPLIED TO MINING.

By C. P. SPARKS, M.I.E.E.

(Abstract of paper read before the Institution of Electrical Engineers, *February 25th, 1915.)*

(Continued from page 341.)

The following are the consumptions of low-pressure and high-pressure steam per kilowatt-hour when working under mixed-pressure conditions:—

	Lb. of Low-pressure Steam	Lb. of High-pressure steam	Vacuum (Bar.=30 in.)
Full load	20 ...	6.4 ...	27.5
¾-load	20.6 ...	3.6 ...	27.65
½-load	40 ...	— ...	27.9

The latest application is at Bargoed, where the exhaust from three main winders, a steam compressor, and fan is utilised. Owing to the considerable back pressure on the main winders with the Rateau system (2½ to 3½ lb.) it was decided to adopt the Samuelson system. The steam accumulator is of the gasometer type having a capacity of 12,000 cubic feet, the dimensions being: Internal diameter, 30 ft.; height closed, 19 ft. 2 in.; height extended, 39 ft. 6 in.

The average quantity of steam dealt with is 60,000 lb. per hour, the momentary maximum rate of flow being 160,000 lb. per hour; any excess steam not used by the turbine passes to the feed-water heater. The back pressure on the main winders never exceeds 0.5 lb.

Owing to the pressure variation being very small it is impossible in this instance to control the admission of the low-pressure steam to the turbine by change of pressure, as in the Rateau system; the supply of exhaust steam is therefore directly controlled from the steam accumulator, an oil relay valve being actuated when the former is 2.5 feet from its lowest position, which valve definitely closes the low-pressure steam valve on the turbine until a further supply of exhaust steam is available.

Exhaust steam is supplied to a 2,000-kw. 3,000-r.p.m. Fraser and Chalmers—Siemens turbo-alternator. This set supplies current into the common network. The governing is extremely good, and no difficulty has been found in changing from low-pressure to mixed-pressure steam, the interchange of load with the gas-engine plant not exceeding 100 kilowatts with the turbine fully loaded.

The condensing plant is of the jet type with a Leblanc air pump and circulating pump driven by a 160-h.p. motor at 480 r.p.m.

The following are the steam consumptions per kilowatt-hour of this plant when operating under mixed-pressure conditions:—

	Lb. of L.P. Steam	Lb. of H.P. Steam	Vacuum (Bar.=30 in.)
Full load	30 ...	— ...	28.5
,, ,, ...	— ...	15.6 ...	28.75

The main switchgear controlling this set is erected in the gas-engine house, the excitation and speed regulation being motor-controlled from the main switchboard through relay cables. Supplementary main switchgear is fixed in the turbine house, but this is only operated in an emergency.

The number of working coke ovens at Bargoed is 100; the average quantity of coal carbonized per week is 4,700 tons, and average output of coke 3,800 tons.

The gas-engine plant is part of Mr. E. M. Hann's scheme for dealing with small coal. The "smalls" from the Rhymney Valley are washed and mixed at Bargoed; after extracting the nuts, beans, and peas, the smaller sizes, less "duff" which is used for patent fuel, are delivered by aerial ropeway to the ferro-concrete coke-oven bunkers holding 1,200 tons.

The whole of the gas from the ovens is treated for by-product recovery. After passing through cooling towers, the tar, averaging 56 lb. per ton of coal carbonized, is extracted, this being afterwards distilled into creosote oil and pitch.

Sulphur is then extracted by oxide of iron, the iron sulphide being made into sulphuric acid, part of which is used for fixing the ammonia, something like 19 lb. of sulphate of ammonia being produced per ton of coal carbonized.

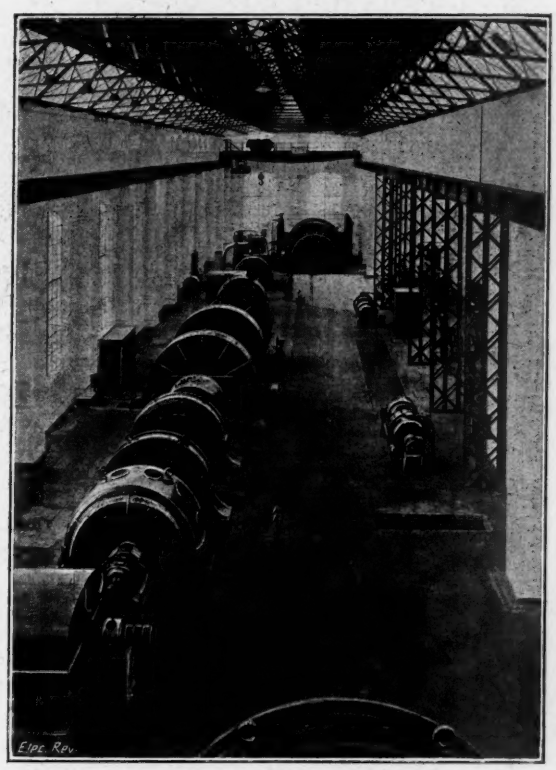


Fig. 1.—General View of Ilgner Winding Plant at Britannia Colliery.

About half of the total quantity of gas is required for heating the ovens; the balance, which is used for the following requirements, is delivered to a gasometer holding 300,000 cubic feet:—

	Average No. of Cub ft. per Week
(1) Gas engines	12,040,000
(2) Sale to gas company	3,000,000
(3) Firing boilers	3,710,000

Analysis of Gas.

Hydrogen	56.4
Methane	20.5
Carbon dioxide	1.8
Heavy hydrocarbons	1.9
Oxygen	0.9
Carbon monoxide	4.7
Nitrogen	13.8

Thermal value 400/410 B.Th.U.—Lower value.

Gas engines of the Nuremberg type, double-acting 4-cycle, are direct coupled to flywheel alternators, one of 1,000 k.v.a., and two of 2,000 k.v.a. rating, running at 3,000 volts and 100 r.p.m.

The smaller set is of the tandem type and the larger sets twin tandem, developing at normal full-load rating 600 b.h.p. per cylinder.

Cylinders 34 in. × 43 in. stroke.
Weight of flywheel of 2,400 b.h.p. sets 76 tons.
Diameter of shaft of 2,400 b.h.p. sets 30 in.

These plants were originally worked at average loads of 700 and 1,400 kilowatts. The combined maximum load for one large and one small set is 2,500 kilowatts, the usual practice being to run one large gas engine continuously and the smaller gas engine during the day shift.

When working at these loads, the cost of repairs was found to be unduly high on cylinders, pistons, piston rods, and exhaust valves, and since 1912 the plants have been worked at average loads of 600 and 1,200 kilowatts, the combined maximum load being 2,200 kilowatts. Since modifying the rating of this plant, the life of pistons, piston rods, and exhaust valves has increased, and no cylinders have been cracked.

Tests showed that the heat consumption of the 2,000 k.v.a. sets was:—

At full load ...	12,800	B.Th.U. per kw.-hour
At half load ...	20,400	,, ,,

In order to utilise the surplus gas to the best advantage, electric pumping was adopted simultaneously with the erection of the gas-engine plant, and by providing high-power pumps and increasing the size of lodge rooms it was found possible to confine the hours of pumping to from 8 to 12 per day at the Elliot Pit. The gas-engine plant thus supplies the general colliery demands during the day and the main pumping at night.

With an output of 14 million units per annum and a maximum load of 2,200 kilowatts, the annual load factor of the gas-engine station is 72 per cent.

No general statement can be given as to the total fuel consumption, as in the case of the Powell Duffryn Company 14 million units are generated by coke-oven gas, about 14.5 million by exhaust steam, and the balance of 21.5 million by live steam.

In the case of the Aberaman Collieries, the weekly coal consumption, operating on a station load factor of 47 per cent.,

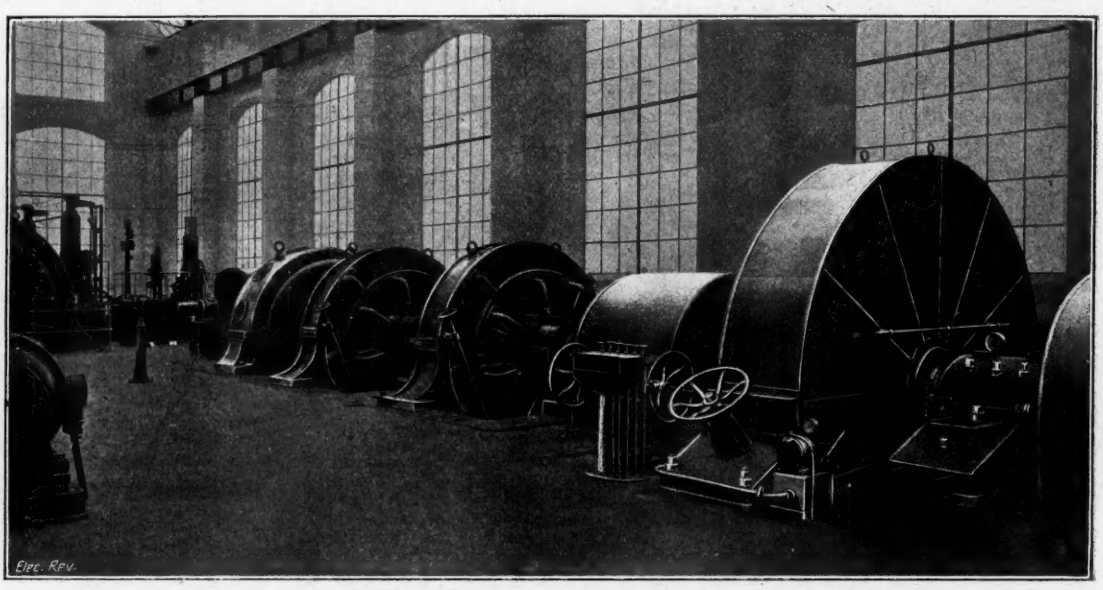


Fig. 2.—One of the Ilgner Converter Sets.

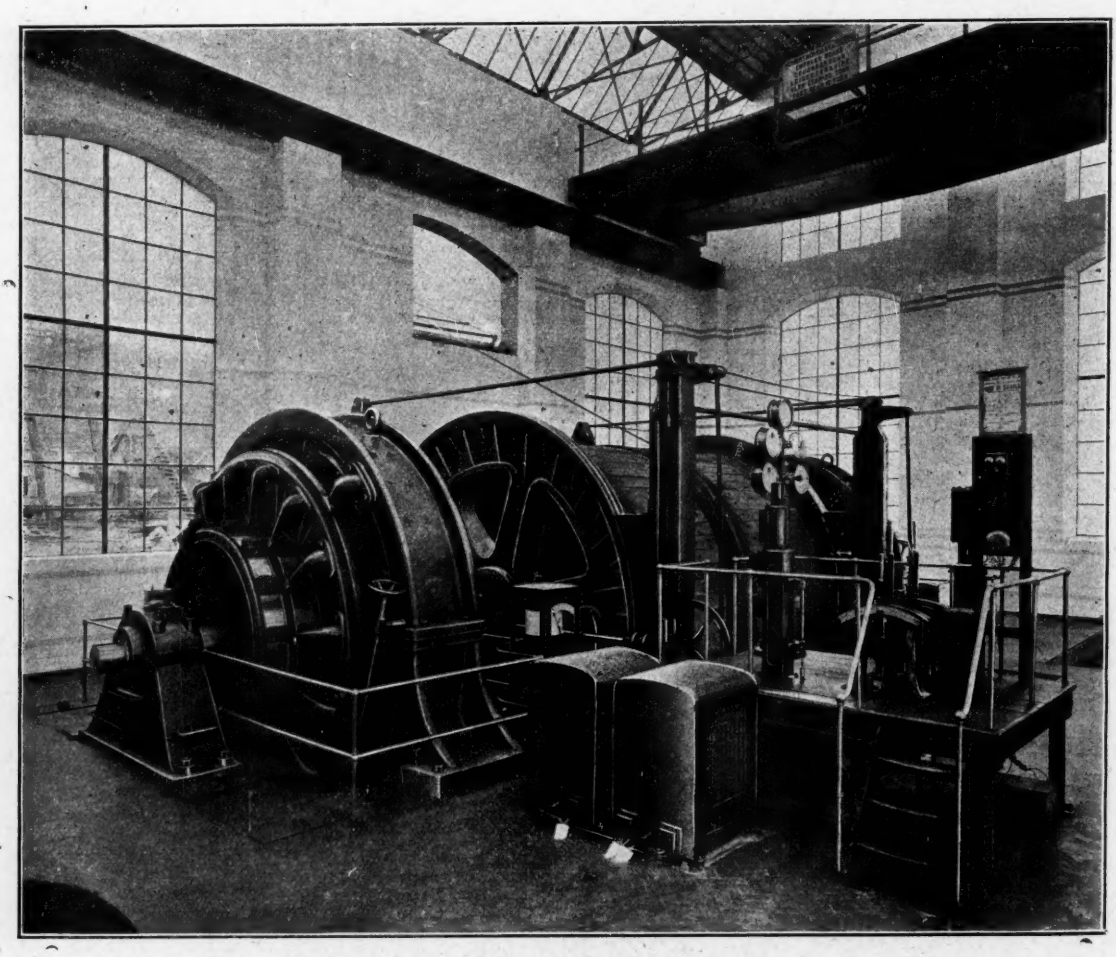


Fig. 3.—Siemens Electric Winder.

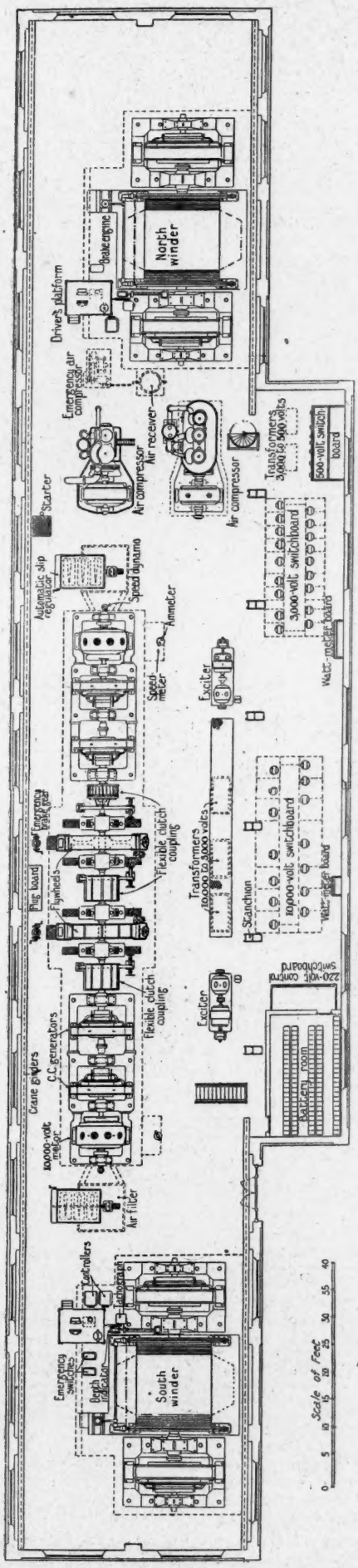


FIG. 4.—ARRANGEMENT OF ELECTRIC WINDING PLANT AT BRITANNIA COLLIERY.

is 2.9 lb. of fuel (one-third washed "duff" and two-thirds grains), the average calorific value as fired being 12,600 B.Th.U.

The comparative heat consumptions per watt-hour for the gas and steam stations are :—

	Annual Load Factor	Average No. of B.Th.U. per Watt-hour
Gas	72 per cent. ...	18.0
Live steam	47 per cent. ...	36.5

Winding Gear.—The Britannia pits of the Powell Duffryn Co. are equipped with two main winders, supplied by Messrs. Siemens, the mechanical parts being by Messrs. Fraser & Chalmers. Each winder has a parallel drum 14 ft. in diameter, for use during the sinking period, designed to form part of the final drum 14 ft. to 22 ft. of cylindro-conical type, and is coupled direct to two motors, rated to develop as a maximum 4,300 horse-power (figs. 1 to 4).

The 10,000-volt 3-phase supply is converted to continuous current by two Ilgner converter sets, designed for a winder duty as under :—

Depth of shaft	730 yards.
Output of coal per hour ...	360 tons.
Net load of coal per wind ...	6 tons.
Diameter of rope	2⅛ in.
Max. speed of rope	72 ft. per sec.
Unbalanced load	13 tons 2 cwt.
Time of wind	48 sec.
Time of each complete cycle ...	60 sec.

Each converter set is capable of supplying one main winder (fig. 3), and consists of an induction motor, two continuous-current generators, and a 30-ton flywheel. When the colliery is further developed a third (spare) Ilgner set will be added.

The two sets are erected in line, with three needle-type flexible couplings, combined with friction clutches, between the

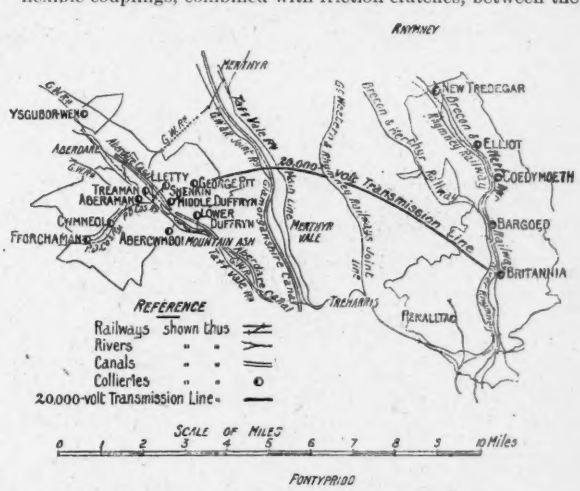


FIG. 5.—PLAN OF POWELL DUFFRYN COLLIERIES.

wheels and converter sets, so that the two flywheels can be run together with either converter set, the two sets being 100 ft. in length over all.

Owing to the proximity of the winder house to the shafts, special care was taken in the design of the foundation. The main foundation consists of a reinforced concrete girder.

During the sinking period one converter set was used for both winders, each of its generators supplying one motor on each winder. As the 10,000-volt supply was not available at the commencement of the sinking, the induction motors were supplied at 3,000 volts, their stator circuits being temporarily connected in mesh; the motors then each developed a maximum of 750 B.H.P., being designed for full-load output, when star connected, at 10,000 volts.

The motors are of the enclosed self-ventilating type, drawing air through dry-air filters and discharging it direct into the winder house.

Continuous output	1,750 b.h.p. each.
Power factor at full load ...	88 per cent.
Efficiency	93.5 per cent.
Temperature rise	35 degrees C.
Speed	492/425 r.p.m.
Maximum slip	15 per-cent.

When the main winder is working at full duty raising six tons of coal per minute, the input of the Ilgner set will average 1,300 KW.

The speed of the motor is controlled by series transformers in the motor circuit, the secondaries of the transformers supplying current to an induction motor arranged to vary a liquid resistance in the rotor circuit. The maximum slip-ring voltage is 700 volts.

Each set of variable-voltage dynamos is designed for a maximum output of 3,500 kilowatts, the continuous rating being 2,100 kilowatts.

Pressure per machine, ± 600 volts; efficiency, 93.2 per cent.; temperature rise, 40 degrees C.

These machines are of the 8-pole type fitted with inter-poles and compensating windings and double ventilated commutators of 3 ft. diameter.

Each flywheel is a solid steel casting weighing 30 tons, in a planished steel casing.

Diameter, 12 ft. 6 in.; width of rim, 30 in.; stored energy at max. speed, 31,000 ft.-tons.

The bearings are water-cooled, ring-lubricated. Auxiliary pressure lubrication is supplied, by motor-driven pumps, from an overhead tank, and is used when starting up and during the summer months.

Each winding drum is coupled direct to two motors, one on each side (fig. 4). These machines have 16 poles and are fitted with interpoles and distributed compensated windings. The commutators are of 7 ft. 3 in. diameter, built in two parts with ventilating channels between them. Each motor is rated to have a maximum output of 2,150 horse-power, the continuous rating being 1,300 B.H.P. The voltage at the armature terminals varies from 0 to ± 600 volts.

Speed, 62 r.p.m.; efficiency full load, 92 per cent.; temperature rise, 40 degrees C.

The excitation for the fields of the winding motors and of the variable-voltage dynamos is supplied by one of two 80-KW. 220-volt motor-generators, fitted with boosters. An accumulator of 60 KW. capacity on the half-hour rating is also provided.

The battery floats on the exciter system, so that in the event of an interruption of the main alternating-current supply, a wind could be completed by means of the stored energy in the flywheels.

The connections to the control board are arranged so that any two of the four dynamos can be run in series with the two motors of either main winder. The winding motors are controlled by varying the excitation of the generators, the main circuit never being opened.

The control gear consists of three levers:—

The main control lever controlling the excitation of the generators supplying the winder.

The working-brake control lever.

The emergency brake.

These three levers are interlocked with each other in such a way that full current cannot be applied to the winding motor while the brake is "full on," and also the brake cannot be applied whilst the full current is flowing in the motor. An interlock is also provided so as to prevent the trip gear of the emergency brake being reset unless the main control lever is in the "off" position and the brake control lever in the "full on" position.

The main control lever, which is connected to the main controllers and depth indicator, is controlled by cams on the quiter so that the winding motor cannot be accelerated beyond a predetermined rate. Should the driver neglect to operate the control lever, the winding motor is automatically retarded and brought to rest.

The brake control lever is connected to a cross shaft which is coupled to the operating valve on the brake engine.

The emergency brake is applied by either of the following means:—

1. By hand.
2. By the current failing.
3. By the air pressure failing.
4. In the event of overwind by either cage.
5. In the event of excessive overload on the winding motor.

The drum shaft is of 24 in. diameter and 3 in. bore, with journals 22 in. × 40 in. The shaft is forged with solid half couplings at each end for coupling to the motor shafts, the couplings being fitted with cross keys to relieve the bolts of the shearing stresses.

The drum is fitted with two sets of post brakes, the brakes being capable of pulling up and holding at any point in the shaft a lowering load of 8 tons.

In addition to a hand-operated band brake, each flywheel is provided with an electromagnetic brake acting on the rim of the wheel and capable of bringing the converter set—with one flywheel—to rest from full speed in 8 minutes. The time taken by the same set to come to rest when running free is about one hour.

During the sinking period each winder was operated by one motor, the drums being of 14 ft. diameter. The loads consisted of men, rubbish, building material, and water, the maximum unbalanced load being 8 tons.

On completion of the sinking to 750 yards, operation was continued with the 14-ft. parallel drum with one motor raising two trams of coal or rubbish.

Following the partial opening-out of the colliery, as the cylindro-conical drum could not be erected for some months, a balance rope has been fitted on the winder with the 14-ft. drum, thus enabling one motor to raise four trams of coal (6 tons). Working under these conditions with 19 winds per hour and a winding time of 80 seconds, the number of kilowatt-hours taken by the Ilgner set average over one hour is 3.7 per ton of coal wound.

On completion of the cylindro-conical drum, when winding 390 tons of coal per hour, the input into the Ilgner set will be 1,360 units per hour, or 3½ units per ton of coal wound from 730 yards.

(To be continued.)

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Homonolith.

We have received from MR. H. SLOOG, of 51, Anson Road, Cricklewood, N.W., a sample of "Homonolith," in which material his works are now prepared to supply all kinds of turned articles, polished or otherwise, at low prices. The substance is intended to replace "Galalith" in every way; the specimen is a black rod possessing considerable strength, and cutting like bone; when held in a flame it burns with difficulty.

Weights and Measures Computer.

An ingenious instrument has been devised by LIEUT. F. SEXTON-SNOWDON, of 22, Henrietta Street, Covent Garden, W.C., to save labour and ensure accuracy in converting the value of goods offered in the currency and measures of one country into the equivalent value in terms of those of another country. The device resembles the familiar date indicator, and is provided with two handles, the rotation of which performs the desired operation. The range of the instrument is from ¼d. to 10s. per lb., gallon or foot, but a variety of spools is being prepared to meet other requirements, the spools being interchangeable. All values are calculated to five places, on the basis of the average rates of exchange prevailing before the outbreak of war; but a table of corrections from 5 per cent. above to 5 per cent. below the basis figures is provided. Full particulars can be had from the inventor.

"Witton" Field Regulators.

THE GENERAL ELECTRIC CO., LTD., of Witton, Birmingham, have designed a small type of rectangular regulator for use in exciter circuits. This regulator, which is shown in figs. 1 and 2, consists of two parallel lines of rectangular contacts mounted on a slate base, which is carried on a strong steel framework on which is also mounted the resistance, composed of special resistance wire

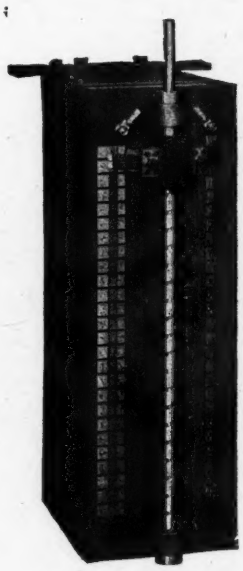


FIG. 1.—"WITTON" REGULATOR FOR EXCITER CONTROL.

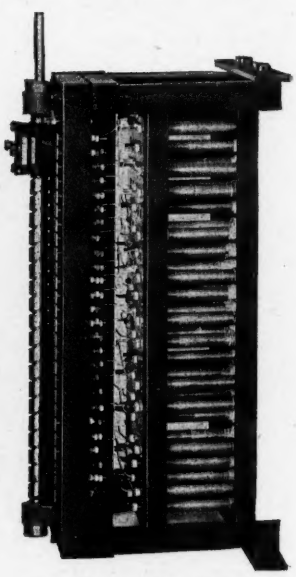


FIG. 2.—INTERIOR VIEW OF "WITTON" REGULATOR.

wound on asbestos tubes. These asbestos tubes are carried on steel supporting bars, which are bolted at both ends to the framework. The connections between the resistance wire and the contacts are solid, there being no loose wires; this follows on standard G.E.C practice for all their regulators and starters. The regulator illustrated was one of a number constructed for controlling the shunt current of the exciter for a 3,000-KW. turbo-alternator.

Igranic Electric Vehicle Controllers.

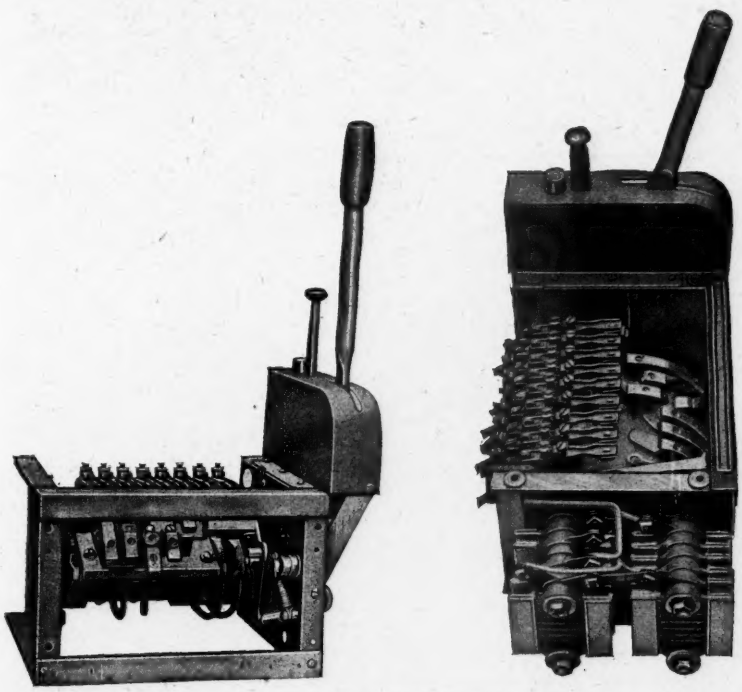
Drum-type electric vehicle controllers are made by the IGRANIC ELECTRIC CO., of 147, Queen Victoria Street, E.C. The pressed steel frames used are very strong, but light in weight and easily mounted; all contacts are of ample capacity, and the total voltage drop across the controller is negligible. Contact rings are made of drawn copper. The fingers are of unique design, being pivoted and pressed into contact with the drum cylinder by helical compression springs. The renewable tips of the fingers are of drop-forged copper.

This form of drum construction is one which has proved its excellence in electric crane and steel mill service. It is claimed that it is more robust, and can be operated with less effort, than other types.

The controllers are so designed that transitions of field and battery connections are made by bridging, and therefore without interruption of motor torque.

The resistances supplied are of the cast-iron grid type, and can be supplied attached and connected to the controller, or separately, as desired.

Wherever necessary magnetic blow-outs are provided on controllers for the purpose of promptly extinguishing the arc.



Figs. 3 and 4.—Igranic Electric Vehicle Controllers.

Practically all electric vehicles are operated by means of series-wound motors which have their field windings in two sections. The controllers described are designed for use in connection with motors of this type.

They are divided into two classes—the first class comprising those controllers which accomplish speed control by means of armature resistance and series field commutation—the second those controllers which are adapted for the commutation of batteries, as well as field windings, the batteries on the car being divided into two sections, and these two sections connected either in series or parallel relationship, depending upon the speed required.

Each of the two classes mentioned above can be further subdivided into those which accomplish forward and reverse control of the vehicle by means of one operating lever, and those which have a separate reversing lever.

The controller is designed for mounting under the seat for left-hand operation. The safety switch is conveniently mounted just behind the speed control lever with which it interlocks. Pulling up on this rod cuts off the current independently of the control lever. It can only be re-closed when the control lever is in the neutral position.

The first class of controller mentioned is adapted for use on those cars whose maximum speed does not exceed 18 miles per hour, while the second class is adapted for machines operating above this speed, or for slow speed machines which may be called upon to operate at greatly reduced speeds for considerable periods of time.

The single voltage controllers for moderate speed vehicles provide five speeds forward; the connections are as follows:—Motor fields in series (1) two steps of resistance in circuit; (2) one step of resistance in circuit; (3) no resistance in circuit; (4) motor fields in parallel—no resistance in circuit; (5) motor fields in parallel, shunted—no resistance in circuit.

Double voltage controllers provide five speeds forward as follows:—(1) Fields in series—batteries in parallel (2) Fields in parallel—batteries in parallel. (3) Fields in series—batteries in series. (4) Fields in parallel—batteries in series. (5) Fields in parallel, shunted—batteries in series.

It should be noted that all five control points on double voltage controllers are economical running positions, and that on no point are any material resistance losses sustained, as is the case with single voltage controllers.

Where controllers are adapted for forward and reverse operation by means of a single lever, three reverse positions are provided, these corresponding with positions one, two and three forward.

Wherever a separate reversing switch is provided there are, of course, as many reverse as forward positions. Single lever controllers can be furnished either with or without a separate main switch. When a main switch is provided, it is so interlocked with the control drum as to prevent its being closed at any time except when the control lever is in the off position. Furthermore, when a main switch is provided it can be interconnected with the foot-operated brake in such a manner as to be moved to the open-circuit position whenever the brake is applied.

Those controllers which have a separate reversing switch are provided with a cam mechanism adapted to be connected to the foot brake lever. This cam is so arranged that whenever the foot brake is applied the reversing switch is moved positively to the open-circuit position, in which position it latches and cannot be released unless the control lever is thrown to the off or braking position. This separated interlocked reversing switch can also be connected to an operating lever on the car, and thereby made to serve as a safety switch.

Extra Heating Surface for Lancashire Boilers.

In view of the deficient heating surface of Lancashire boilers, and the present high price of coal, users of such boilers should be interested in the Adamson-Davies patent tubular extension, which has been brought to our notice by Messrs. J. P. Davies and Co, of 39, Thornbury Road, Isleworth, Middlesex. The device is illustrated in fig. 5, and remembering the fate of the cross-tubes so much in vogue 20 years ago, at first sight one might be unfavourably disposed towards it; but it is worth careful consideration.

It will be noted that the extension consists of an element of a water-tube boiler having a heating surface about half that of the flue-tube in which it is fitted; thus the extension increases the total heating surface of a Lancashire boiler by 30 to 40 per cent., and being situated in the direct path of the hot gases, its effective value is still greater. The flue is not weakened by the attachment of the extension, and there is no difficulty in cleaning the flue and tubes, as a man can pass right through the flue from end to end. The boxes are not exposed to the hottest gases, and the tubes do not accumulate scale, as all sediment is deposited at the bottom of the boiler; but a brisk circulation is maintained, and steam can be raised quickly. The arrangement is obviously free from troubles due to expansion and contraction, and the tubes can be withdrawn through the furnace if required.

It is claimed for this system that it enables a saving in fuel of

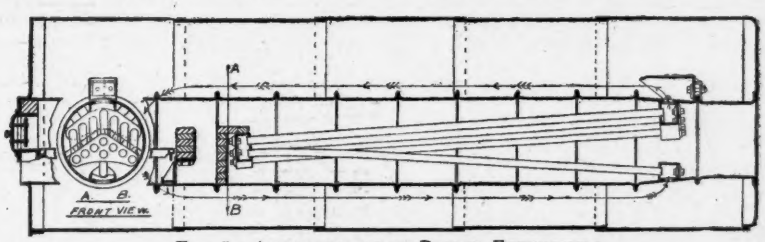


Fig. 5.—Arrangement of Boiler Extension.

10 to 20 per cent. to be effected, besides increasing the output per boiler, so that four boilers thus equipped will do the work of five without the extension, and tests are quoted showing an improvement of 25 per cent. in fuel consumption. As many as eight boilers belonging to one firm have been successively fitted with the device, as the result of experience of its working. It can, of course, be fitted to existing boilers without difficulty.

Rotary Pumps.

One of the most recent additions to the world of pumps is a positive rotary pump made by the New Rotoplunge Pump Co., Ltd., of 24, Broadway, Westminster, S.W. This pump incorporates a plunger action with a rotary motion, which may best be shown by the accompanying illustrations (p. 380).

The rotor, which is of steel or gun-metal, to suit the liquid the pump has to handle, revolves in a cast-iron case, with a close clearance. Arranged in the rotor is a set of cylinders, either four or six in number, set diametrically opposite each other. In these cylinders are placed the plungers—the two opposite plungers being coupled together, as shown in the views. Movement is given to these plungers, as the rotor revolves, by a steel block mounted on a pin, which is held in position by the end cover. This pin is set on a different centre to the rotor, and causes the plungers continually to alter their relative positions in the cylinders, as the rotor rotates.

One of the chief merits of the pump is that it can be used equally as well on vacuum or air-compressor service as on water. It is further an ideal pump for crude sewage, on account of the complete absence of valves. There is only one stuffing-box, which is water-sealed, and one bearing, which is lubricated with an oil-ring. The pump being absolutely positive gives an output exactly proportional to the speed, and this is usually between 500 and 1,000 R.P.M. The piston speed of the pump is kept at about 150 to 250 ft. per minute, and the bearings are designed on an extremely liberal basis.

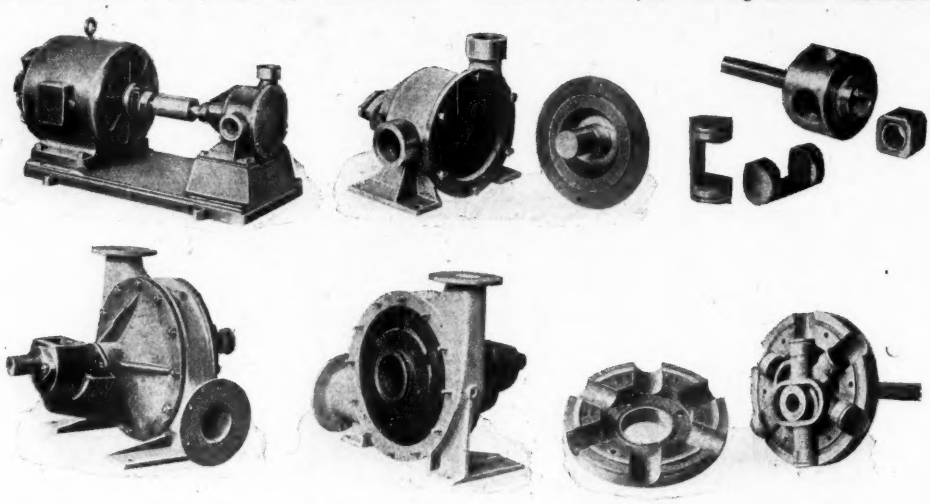


Fig. 6.—Four-Cylinder and Six-Cylinder Rotoplunge Pumps Complete, and in Parts.

The pump is constructed in sizes from ⅜ in. up to 24 in. bore, and for all pressures, and when working on a closed suction a vacuum within ·25 in. of the barometer can easily be maintained.

As regards efficiencies, these nearly always equal, if not exceed, those of a plunger pump for the same work, and the volumetric efficiencies are extremely high owing to the close clearances. A useful feature of the pump, in which it differs notably from a centrifugal pump, is that its output is simply proportional to its speed, and a high efficiency is maintained, whereas a centrifugal pump can only run with high efficiency under the particular conditions for which it is designed.

The cost of upkeep is low on account of the small number of parts, and accessibility is a strong feature, for by removal of the end cover, the whole pump is exposed, no pipe joints being removed or broken.

Mazdalux Reflectors.

The British Thomson-Houston Co., Ltd., of Mazda House, 77, Upper Thames Street, E.C., in 1912 introduced the "Mazdalux" metal reflectors, which then occupied three pages in one of their price lists. So successful have these industrial reflectors been, that the company has just issued price list No. 10,336, devoted entirely to them and the accessories used with them, and a few days ago we paid a visit to Mazda House to inspect the new types and sizes of reflectors to which it relates—and which, we note, all are (and always have been) entirely British made. The range now covers standard Mazda lamps from 10 to 1,000 watts, and Mazda half-watt lamps from 100 to 1,500 watts. An ingenious system of classification, numbering and labelling has been adopted, which enables the complete description of every reflector to be conveyed by a single catalogue number, while the directions on the label are calculated to render erection a matter of the utmost simplicity. Special attention has been given to the new caps or housings which carry the reflectors proper; according to size, these fit, or spring on to, the usual B.C. holders, or grip the skirt of the lamp cap or in still larger sizes, carry the all-porcelain lampholder bearing of these upon the height and spacing of the lamps is explained, with useful hints on planning lighting installations, and a novel chart for the same purpose. Besides various bowl patterns, there are many "angle" types for asymmetrical distribution, and we illustrate one of each of these groups in figs. 9 and 10, while fig. 11 shows a special lock-up "local" type with a wire cage to prevent the unauthorised removal of the lamp or reflector.

Fig. 7.—Cap sprung on Lamp Cap.

Fig. 8.—Adjustable Weatherproof Housing (No. 08).

Fig. 9.—Mazdalux Bowl Reflector for Ordinary Lamp.

Fig. 10.—Reflector for Half-watt Lamp, 15° Angle Type.

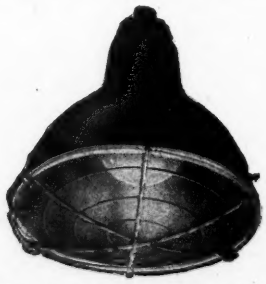


Fig. 11.—Special Local Type.

The reflectors are of enamelled steel or aluminium, with matt aluminium reflecting surface, or steel with white vitreous enamel inside and outside.

The list contains much information, and will be found useful in many respects.

Roller Bearings.—Messrs. Broom & Wade, Ltd., have just completed delivery of some 200 3-in. Hyatt roller bearings to the Associated Equipment Co. for the line shafting in their new works, which is being entirely equipped with them.

THE SELLING SIDE OF ELECTRICITY SUPPLY.—I.

Showroom Windows.

In the selling scheme of the supply of electricity the showrooms play a very important part; this is so for the reason that much educational work has always to be done in familiarising the public with electrical appliances. One would never be very sanguine about selling an electric cooker, or even a toaster for that matter, purely by advertising and distributing literature in the district served. This part of publicity work has its value, but in itself can do little beyond the preliminary ground work. Mr. "Consumer" wants to see the apparatus, what it looks like, how it works, and it is necessary therefore to have a showroom containing an exhibit of electrical goods for his inspection. There are many of these showrooms springing up now, and judging by the general arrangement, selection, and show of goods, it is evident that a few hints will not be out of place from one who has had extensive experience in showroom management. I have recently seen several of these showrooms which, to my mind, have completely failed in several of the details essential to their success.

One of these showrooms (a London one), as far as I could see, had not had the slightest alteration in the window display since my last visit to the locality, several months before. So much has been written on the subject of window display, and the importance of frequent changes, that anything further would have seemed superfluous without the evidence of one's eyes to the contrary.

Any man in charge of a showroom should pay frequent visits to the best shopping centres. If he is observant he will notice that the most successful shops in almost any line of business have the most attractive windows; he will further find that these windows are always being changed. There is no finality in window display; they must be dressed and re-dressed. The idea to be kept in mind is to let nobody get into the habit of passing your shop without glancing in. A hint might well be taken from the best-dressed windows in the West End of London; they are for ever changing, and if this is considered worth while in such a thoroughfare, say, as Oxford Street, which is always thronged with shoppers and sight-seers, how much more important it must be to alter the display in a less frequented part so that a glance or a visit may be secured from every likely consumer? Energy is an essential quality for a showroom manager, and he must never be tired of making alterations. It must be kept in view that to display appliances and apparatus tending to extend the revenue from existing services without entailing fresh capital outlay is one of the first objects of a supply undertaking showroom. Therefore irons, kettles, toasters, radiators, cookers, and all the long list of "other uses" should be kept well to the fore. Nothing should be easier than to make an attractive display with these things. We have the public interested in electricity to start with. Think of the difficulty of breaking the monotony of a shop window displaying sewing machines or, in fact, any one-line business. Yet it is done, and it is an art in itself.

It will make our task of constant change easier if we make a point of "featuring," as our American friends put it, some special article each time. It also carries a stronger impression to show a group of appliances of the same kind than a dozen oddments. Then these should not be left to speak for themselves. Attractive showcards take a high place in any selling scheme. What the appliance is for; what it costs to buy; what electricity it uses; how to use it; where to use it, etc., etc. The showroom windows should not be crowded with articles, and the goods themselves should be kept clean, as well as the windows and fitments. This may appear obvious enough, but it is a remark that is called for. Nickel-plated goods should really be kept in special cases similar to those used by jewellers; it is the only way to keep them in a saleable condition. If shown in an open window they must be frequently cleaned; in the dull state which they assume after a few hours in an exposed atmosphere they are more likely to repel people than to attract them. Something in motion is a draw—even the old dodge of a silk ribbon blown out by a fan can be made effective; one way is to fasten one end to the fan-guard and the other end to an iron or some other appliance upon which you wish attention focused.

In displaying toasters, for example, a fresh piece of toast should be made once or twice a day and placed in the rack; show everything as far as is possible performing the function for which it is designed. There are many ways of doing this, and we are going to help by making suggestions in these columns from time to time.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Coke Fuel for Steam Raising.

In the interests of my Committee may I be allowed to correct an impression which might be conveyed by the remarks made in reference to the above subject by Mr. Horace Boot, as reported in your last issue, at the annual meeting of the South Metropolitan Electric Light and Power Co., Ltd.

In discussing the policy of the company in adopting coke fuel for steam raising, and the favourable report of Mr. H. W. Bowden, the engineer-in-chief, on his experiments in this direction, Mr. Boot is reported to have said that the price of coke breeze had risen from 6s. to 8s. per ton, and that in his experience the use of this fuel would have reduced by half the life of certain steam boilers with which he had experimented. It would be interesting to many users of this class of fuel to know the precise conditions of Mr. Boot's experiments, as it is within the knowledge of a large number of engineers that steam boilers of most types common to this country are operating satisfactorily on coke breeze, and also that there are many instances where no other class of fuel has been used; and this without the baneful results indicated, and without adverse comment being received from inspectors employed by the leading Boiler Insurance Companies.

One concrete instance may be given which will be appreciated by engineers responsible for the maintenance of boiler plant operating on coal slack containing the usual proportion of volatile sulphur. In evidence recently given before the Departmental Committee on Coal Smoke Abatement, Mr. Edward Allen, chief engineer of the Liverpool Gas Co., stated that in his experience Babcock water-tube boilers had been fired with coke fuel over a period of 15 years without the necessity arising of renewing a single tube.

Similar experience with most types of boilers at colliery, coke-oven and other works where the use of raw coal is not permitted (and where boiler capacity is not an unimportant consideration) could be quoted *ad infinitum*. These boilers are almost invariably operated under impelled-draught conditions at their full normal capacity.

The increase in price reported by Mr. Boot is entirely due to conditions brought about by the war, and, unfortunately, is common to all classes of solid fuel and to a greater extent in the case of coal; but even at the higher figure indicated, coke breeze is still the best fuel value at present obtainable in London. Makers of furnace apparatus will guarantee an evaporation of 6 lb. of water per pound of breeze and rates of combustion exceeding 30 lb. per sq. foot of grate per hour have been maintained with automatic mechanical stokers of the underfeed travelling-grate type, illustrated and described in the *Journal of Gas Lighting*, July 25th, 1914.

Mr. Bowden is probably correct in stating that his is the first power-house stoking-equipment specially installed in this country to use coke breeze exclusively, and his achievement in continuous operation is certainly unique; but many of the more up-to-date power stations, whose stoking appliances do not restrict them to the use of one uniform class of coal, are now using coke breeze extensively, while others are using coke to the total exclusion of all other solid fuel for steam-raising, thus realising considerable commercial advantage in addition to the practical advantage of smokeless combustion.

As a matter of local interest it may be worthy of note that coke is now produced in the London district to the extent of over 2 million tons annually. In normal circumstances, a considerable

proportion of this output is exported at a price considerably below that at which coal of equal evaporative value can be bought in London.

Engineer and Fuel Expert.
London Coke Commission.

Westminster, *March 9th*, 1915.

"Totally Enclosed" Motors.

I have for a number of years been a subscriber to the ELECTRICAL REVIEW, and have from time to time read with special interest some of the correspondence on various subjects which has appeared in your columns.

As this correspondence is undoubtedly perused by both manufacturers of electrical machinery and manufacturers' representatives who are more or less responsible for the negotiations for the sale of such plant, it occurred to me that some of those interested might be able to enlighten me, and also several others with whom I have spoken on the matter, as to what really constitutes the total enclosing of an ordinary industrial electromotor.

From experience in dealing with prospective buyers and users of electric motors for certain applications, it seems that the term "totally enclosed" is construed by the layman in its literal sense, and is generally understood by him to mean "absolutely enclosed" to the exclusion of dust and any foreign matter that may be floating about in the surrounding atmosphere.

Manufacturers, on the other hand, do not appear to recognise this interpretation of the term as being the correct one. Their definition of totally enclosing appears to imply nothing more than a solid cover enveloping the whole of the working electrical parts of the machine, rendering them quite inaccessible to either attention or inspection, except by removing portions of the casing which are designed for the purpose.

Probably there may be other commercial engineers who have experienced the difficulty of persuading a prospective customer that a totally enclosed motor is not the absolutely enclosed machine which it might reasonably be assumed to be, and no doubt a more detailed definition of such motors than the writer has yet found, will be very acceptable.

I should be obliged if any of your readers could refer me to any authoritative definition which clearly states the features of totally enclosed, or totally enclosed pipe-ventilated, motors, without ambiguity.

Walbrook.

London, E.C., *March 9th*, 1915.

Trouble with Oil.

In response to "Inquirer" *re* the above trouble, one could have desired a little more information than is given. As the "shaft is quite dry," this can be eliminated at once. Now, as the engine must run with all casing and bed-plate doors in position, the only other place to exude oil is the bare expanse of piston-rods. If, as I suspect, the engine is using highly superheated steam, the H.P. rod will be found to give off a thick blue vapour. This is (usually) only visible on a day on which the sun shines through the windows, and then in its beams the blue vapour is clearly discernible, and it will be found to proceed from the source indicated. As to its ourney to the inside of the dynamo, is there any window or ventilator which would assist it towards the machine end? If so, this should be stopped immediately, and a good fan installed in a high position to clear the atmosphere. Finally, if found absolutely necessary, the aperture in the guide giving access to the H.P. packing gland and scrapers may be covered in back and front by sheet metal doors. This, however, is not without its drawbacks for the drivers, who prefer an open space in order that an eye may be kept open for "hot rods" and any "swabbing" done if required. In any case, only the H.P. rod need be treated thus.

Triple-Expansion.

Salaries of Engineers.

Herewith I am forwarding you cutting (see below) from the ELECTRICAL REVIEW Supplement, page 16, November 13th, 1914, appearing under the heading "Situations Vacant":—

VACANCY for young engineer to act as Works Superintendent. Must have following qualifications:—First-class technical education in mechanical and electrical engineering, and some knowledge of elementary chemistry. Two years' practical experience in power station running and repairs. Some knowledge of draughtsmanship and drawing office work. Experience in gas works and gas analysis desirable. Salary, £120 per annum.—1063, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

On reading the advertisement referred to above, I notice the salary is £120 per annum; should this not read £1,200? Surely the former amount must be a misprint.

Provided £120 is the correct amount which is offered for a man with such colossal qualifications, and is a fair criterion of what is offering in the way of salary at home at the present time, then all I am able to say is that I am not returning to England until the market price has advanced somewhat.

Doubtful.

Sydney, *January 16th*, 1915.

P.S.—This country is not looked upon as the best in the world for labour, but a bricklayer can obtain his £200 a year to say the very least of it.

Trade Routes to Russia.

In the "War Items" of the current issue of the ELECTRICAL REVIEW you reprint an extract from an American report which has just been issued. It is quite evident that this report does not contain such up-to-date information as reports emanating from America usually do. Moreover, there are several quite misleading pieces of information, and I would strongly advise your English readers to take no notice of it.

With the exception of very urgent war material, and little even of that, practically no ordinary commercial goods have been going *viz* the railway to Vologda for months past. One method has been to send goods *via* the Dvina, thence joining the railway from Perm, or, what was lately done, to send the goods on sleighs at a cost of about £18 per ton. Although this amount seems an enormous one for carriage, yet on high-priced goods, such as expensive machinery or valuable metals, it is of little account. I should not advise any of your readers to depend on the Archangel route, even when the port is open, say, by the end of May.

I do not understand what the reporter intends to convey by the expression: "New interest is being taken in the all-rail route from eastern Scotland or England," &c. He seems to have discovered a new route, because I can hardly imagine anyone having the slightest knowledge of the subject being so stupid as to send goods *viâ* Bergen, Christiania and Stockholm to Tornea. There is a direct route from Trondjhem, and still a better one from Narvik across the upper part of Norway and Sweden, and the Narvik to Tornea route is probably less than one-fifth the distance, and consequently almost proportionately less in cost than the imaginary route outlined by the gaseous reporter. If one examines the map of Norway and Sweden one will see how cleverly worked out the reporter's scheme is to mislead the English manufacturer and merchant. No doubt the reporter had in his mind the more expeditious and cheaper route, such as Trondjhem or Narvik, but this, of course, is for his own country's good, and there may possibly be found a supplementary report for American consumption only.

I had the pleasure of travelling over the route suggested by your imaginative reporter, which, I may add, is the route usually taken by human freight, and I found the railway connecting the gap had already been completed some two or three weeks, consequently one can affirm that the route has been completed, say, eight weeks. The journey from Petrograd to Stockholm, even when the connecting railway was not completed, only occupied three days, but probably the reporter, or the man he met, would require more time for thinking out these wonderful new schemes than the supply of correct and reliable information to his British friends. I sincerely trust that this route will offer attractions for the shipment of American freight of any kind to Russia.

I am glad to see that the report as a whole bears the same imprint of excellence as do usually all such American reports.

Traveller.

March 5th, 1915.

Japan-China Cable.

Our attention has been drawn to the notice appearing on page 252 of your issue of the 19th ult. relative to the cable connection between China and Japan, which does not give a correct statement of affairs.

As a matter of fact, this company has not parted with any of its cables between the countries in question. It may also be added that the company has a perpetual right to work its cables from Nagasaki, in Japan, connecting the latter place with Vladivostock, in Siberia, and with Shanghai, in China.

Apart from this, the Japanese Government, under an arrangement with the authorities concerned, has laid a cable between Shanghai and Nagasaki. This cable, which is worked by Japanese Government offices at both ends, is, however, only available for Government telegrams and Shanghai terminal telegrams written in Japanese characters, and so-called kana.

I should feel obliged if you would cause a correction to the above effect to be inserted in the next issue of the ELECTRICAL REVIEW.

F. C. C. Nielsen,
The Great Northern Telegraph Company's Representative in England.

London, E.C., *March 5th*, 1915.

Consulting "Engineers."

May I ask for some further information on this subject?

1. Does "Delta" object to a man's obtaining his engineering training while manufacturing artificial teeth? (p. 212, February 12th.)

2. Or, did he mean that a particular man has less training than himself and more push? He asserts the training was obtained.

3. Is "Station Engineer" correct in asserting that "imprisonment or heavy fine immediately follows an individual who attempts to practise as a lawyer or medical man without first qualifying"? My belief is that he is quite wrong, so long as there is no misrepresentation. I do not promise unqualified men much work!

4. If "A.M.I.E.E. and M.I.M.E. sound ridiculous and foolish," does "Station Engineer" aspire to a B.Sc. or M.E. or something better? (p. 270).

5. Does "Alpha" do any serious work and pay fees to the type of consulting engineer he "prefers" ("one who knows nothing, shuts his mouth, and leaves himself in the hands of a few good firms")? (p. 307, February 26th).

6. What do the firms do?

7. How many consulting engineers has he paid fees to (both capable and incapable)?

8. Has "Alpha" followed "Delta's" advice to "look more closely into the qualifications of those to whom they entrust their work"?

9. Did "Alpha's" consultant get the blow *in the back* "after the term of maintenance" and from whom?

10. Do not incapable men find their own level in whatever activity they attempt to follow?

Theodore Stevens.

London, E.C., *March 2nd*, 1915.

Writer's Cramp.

In reply to "W. H. B." in "Medical Electricity," by Dr. Lewis Jones, sixth edition, there is the following:—

"The results of electrical treatment are unsatisfactory. Max Weiss recommends the use of constant currents of from two to five or eight milliamperes, with absolute rest from writing. Further particulars are given."

L. M.

Great relief will be obtained by using the thick cork "anti-cramp" pen-holder, which avoids that undue approximation of the thumb and fingers which produces writer's cramp.

Another W. H. B.

In reply to your correspondent "W. H. B.," as one who during many years has come across, from time to time, various medical applications of electricity, I feel it a duty to give a word of warning to this effect: that the results of promiscuous use of apparatus without advice from a really well qualified medical specialist in the particular ailment it is applied for, may be either good, bad or indifferent, and it is difficult to say which is most likely. The obvious moral is, get such advice, if possible; such specialists generally prescribe for a definite system of hospital treatment in milliamperes and minutes.

Vibro-massage, however, can scarcely do any harm, and might be tried, if available.

Whatever system of relief is tried, it is, of course, greatly helped by strict *regimen* as to diet, outdoor exercise, and avoidance of irritants and debilitants, such as alcoholic liquors and tobacco. Please pardon the mention of the latter. I would not do it, but am sure in some cases of nervous disease (and, of course, hand trembling is a nervous disease), it gives steadiness for the time, the effect having to be paid back at a high rate of interest.

A. W. B.

March 8th, 1915.

THE RÖNTGEN SOCIETY.

AT the March meeting of the Röntgen Society, held at the Institution of Electrical Engineers on the 2nd inst., a paper was read by Mr. ALEXANDER FLECK, B.Sc., of Glasgow University, on "The Chemistry of the Radio-elements." Mr. Fleck supported in the main Professor Rutherford's conception of the atom, which, he said, was the only one commending itself to the mind of the chemist, namely, that the atom consisted of a central nucleus surrounded by rings of electrons, and that it was a positive charge of electricity within the atom, together with the structure of the nucleus, which determined the properties of a given element and gave it its place in the periodic table. In the central ring of electrons the gamma rays had their origin, being produced by the passage of beta particles through the ring. Incidentally Mr. Fleck said that recent generalisations in connection with the periodic law had made it evident for the first time that positive and negative electricity each had a real existence. Previous to these researches upon the structure of the atom, he was not aware that there was any evidence which made it quite plain that positive and negative electricity were two separate and distinct things. So far as they knew until these investigations, positive electricity might only have meant the absence of negative, but this recent work upon the disintegration of the radio-elements showed that within the atom there was positive and also negative electricity, and that the atomic charge in the nucleus was in reality not a positive charge, but was the difference between the positive and the negative.

Mr. J. H. GARDINER pointed out that the actual atoms of which an element was composed were probably not all identical, but differed among themselves, and that what they knew of the properties of an element was simply what they knew of the properties of the mass of these atoms. Lead, for instance, had an atomic weight of 207.1, but this did not mean that every atom of lead had that atomic weight.

Professor NICHOLSON entered into the question whether a difference in atomic weight should be denoted by a difference in the spectrum of a given element, and on the kinematical theory of the origin of spectra he considered that it should. He believed the inner ring of electrons within the atom to be a mathematical impossibility; the only kind of structure they could have in the atom, over and above several outer rings, was nuclear structure, and must be regarded as beta particles which had not yet been born.

Professor A. W. PORTER, who occupied the chair, considered that the new arrangement of the radio-elements, resulting in the changing of the periodic law from something entirely empirical to an orderly sequence, was the most important generalisation made since Mendeléeff, and, indeed, completed the work which Mendeléeff began.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

CANADA.—From February 12th the following provisional increases have been made in the tariff rates:—The general and intermediate tariff rates are increased by 7½ per cent. *ad valorem*, and the British preferential rates by 5 per cent. The general tariff is applicable to goods the produce of countries which have no special treaty with Canada, and the intermediate tariff is applicable to certain specified goods the produce of countries having such treaties. Articles formerly in the free list are made dutiable at 7½ per cent. *ad valorem* under the general and intermediate tariff rates, and at 5 per cent. under the British preferential tariff rates. There is a considerable list of exceptions. Other revenue measures include a 1 per cent. tax on bank-note circulation and the gross income of loan and trust companies and insurance companies' premiums other than life, marine, and benefit insurance; taxes on cable and telegraph messages, steamboat and railway tickets, stamp taxes on cheques, bills of exchange, bills of lading, letters, patent medicines and wines.

GERMANY.—The following statement by the American Consul-General in Berlin regarding the administration of the German tariff since the war, which has just been published by the American Government, will be of interest to manufacturers and traders in this country:—

The war has completely altered the status of trade agreements and customs treaties existing between the German Empire and the nations at war with Germany. It was naturally to be expected that the declaration of war should terminate the peace treaties negotiated at Frankfort and the German trade agreements with Russia, Belgium, Serbia, Montenegro, and Japan. It also naturally follows that the customs treaties by which certain advantages were given on the products of these nations by the German Government should be no longer valid. Furthermore, it was to be expected that the advantages as to duty, which were granted by the provisions of the German-English trade agreement to all the States of the British Empire, would be withdrawn.

The changes in the treaty agreements above mentioned have brought about many intricate and difficult questions, some of which have not yet been settled. It was necessary to give German buyers who had purchased goods before the war commenced an opportunity to enter their goods at the custom-houses on an equitable basis, otherwise great injustice would be done these buyers, because it was not possible for them to calculate upon such a sudden and important change in Germany's commercial relations. These exceptions have been made necessary largely because the condition of war would cause a higher rate of duty to be placed upon goods which were shipped from a country enjoying unusual duty and trade advantages.

A study of the conventional and general tariff system of Germany shows that certain industrial and manufactured products, to which the rates of the general tariff are not entirely applicable, would be particularly affected because the special concessions granted by tariff treaties to other countries would be superseded and disarranged. Certain old and established industries have thus been caused considerable difficulty because they were used to the tariff rates formerly in force and were not in a position to adapt themselves to the unforeseen changes caused by the war.

It was obvious that the immediate application of the higher rates of duty after the outbreak of war was exceedingly satisfactory to certain German industries interested in the domestic production of manufactured goods. Certain industries will undoubtedly benefit by the exclusion of the goods of countries at war with Germany, and these industries will establish themselves during the course of the war in such a way that they will not be easily stamped out when the war is terminated and the usual customs arrangements prevail. In support of this view the war of 1870 is cited, during the course of which the aniline-colour industry made great progress.

Although, strictly speaking, the relations of Germany with respect to the most-favoured-nation clause have been disarranged by the war, an effort has been made to keep the advantages granted to friendly and favoured nations in force until satisfactory arrangements can be made and mutually beneficial decisions reached.

NEW PATENTS APPLIED FOR, 1915.

(NOT YET PUBLISHED).

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

2,798. "Gearing for electric motors for traction or other purposes." C. Turnbull, Jun., & W. T. Dalton. February 22nd.

2,821. "Means for increasing the oscillations in and frequency of electrical circuits." R. Cartwright & H. J. Ball. February 22nd.

2,841. "System of electric ship propulsion." British Thomson-Houston Co., Ltd. February 22nd. (General Electric Co., United States.)

2,865. "Devices for extracting foreign substances from paper pulp, particularly referring to electrically-operated devices for extracting small particles of magnetic substances, as iron or any of the alloys or ores containing iron." A. J. Newell & R. J. Marx. February 22nd. (Complete.)

2,883. "Conduits for electric cables and the like." W. Oates. February 23rd.

2,888. "Automatic and electric block signalling section." W. Wakeford. February 23rd.

2,894. "Heating tools or dies by electricity, as stamping-press tools and the like." W. J. Readett. February 23rd.

2,897. "Electric railway systems." F. G. Brettell. February 23rd. (C. W. Leffler, United States.) (Complete.)

2,902. "Coin automatic electric control." C. W. H. Leathwood. February 23rd.

2,921. "Device for subaqueous signalling stations." Signal G.m.b.H. February 23rd. (Addition to 3,934/13. Convention date, February 23rd, 1914, Germany.) (Complete.)

2,928. "Electric-light fittings or brackets." E. R. Hough & L. Harrison. February 23rd.

2,934. "Portable electric lights." W. J. Mellersh-Jackson. February 23rd. (S. I. Posen, United States.) (Addition to 18,809/14.) (Complete.)

2,950. "Perforated tape duplicator." D. Murray. February 24th.

2,957. "Machines or apparatus for sheathing or braiding wire ropes, cables, hose, and the like with cotton, silk, wire, or like protective coverings or cosings." P. Huntington. February 24th.

2,968. "Covers or protectors of electric switches or other electrical parts or members, and manufacture of the same." J. H. Tucker & J. A. Crabtree. February 24th. (Complete.)

2,969. "Sockets for plug-and-socket electrical connections." L. Maxwell. February 24th.

2,972. "Vehicle brakes and the like." W. P. Thompson. February 24th. (Magnetbremsen G.m.b.H., Germany.) (Complete.)

2,982. "Process for coating metal plates and the like." S. O. Cowper-Coles. February 24th.

2,983. "Manufacture of cartridge cases." S. O. Cowper-Coles. February 24th.

2,984. "Mandrels for use in the electrolytic production of metal tubes and the like." S. O. Cowper-Coles. February 24th.

3,001. "Oil circuit-breakers." F. B. Holt. February 24th.

3,002. "Lamp-signalling arrangements." A. H. Midgley & C. A. Vandervell. February 24th.

3,003. "Electric switches for motor-car and like horns." A. H. Midgley & C. A. Vandervell. February 24th. (Complete.)

3,007. "Protrudable receiver for subaqueous signalling." Signal G.m.b.H. February 24th. (Addition to 16,298/13. Convention date, February 25th, 1914, Germany.) (Complete.)

3,014. "Electric lighting devices for vehicles, particularly cycles." H. C. Contet & A. Picq. February 24th. (Convention date, February 25th, 1914, France.) (Complete.)

3,051. "Electrically-heated iron." G. Cooper. February 25th.

3,082. "Means for operating and controlling electric switches." S. D. Cox & P. S. O'Donnell. February 25th.

3,106. "Electric lamp-holders and similar couplings." A. A. Schaschke. February 26th.

3,120. "Electric iron direct supply stand." E. N. Klein. February 26th.

3,122. "Magnetic compasses." A. S. Newman and Newman & Sinclair, Ltd. February 26th.

3,132. "Electrodes for use in electrical accumulators wherein two different electrolytes are employed." P. Marino. February 26th.

3,142. "Insulating blocks, slabs, and the like." G. A. Herdman. February 26th.

3,181. "Process for the removal of scale, oxide, and grease from metallic surfaces." S. O. Cowper-Coles. February 27th.

3,213. "Device for anchoring electric cables and wires." A. E. Foster. February 27th. (Complete.)

PUBLISHED SPECIFICATIONS.

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

1913.

25,855. Magneto-electric Machines for Ignition Purposes. F. H. Teagle. November 11th.

28,347. Means for Simultaneously Locking and Unlocking the Doors of Railway Carriages and the like. R. W. Willetts. June 9th. (June 9th, 1914.)

1914.

298. Advertising or Signalling Apparatus. J. P. Naylor and Naylorgraph, Ltd. January 5th.

515. Starting and Speed Regulation of Electric Motors capable of Regenerative Action. F. Cumont. January 8th. (Patent of addition not granted.)

2,270. Telephone Systems. Automatic Telephone Manufacturing Co. & A. J. Ray. January 28th.

2,871. Earthenware Troughs for Electric Cables and other purposes. C. E. Doulton & H. L. Morris. February 4th.

2,959. Control Systems for Series Motors supplied with Pulsating Current. British Thomson-Houston Co. (General Electric Co.). February 4th.

3,195. Telephone Systems. Automatic Telephone Manufacturing Co. & J. Savin. February 6th.

3,385. Electric Motor-starters. British Thomson-Houston Co., A. P. Young and E. Garton. February 9th.

3,596. Current-collecting Devices for Dynamo-electric Machines. British Thomson-Houston Co. & F. P. Whitaker. February 11th.

3,696. Fuse Devices for Electrical Circuits. E. O. Schweitzer & N. J. Conrad, & Schweitzer & Conrad (Corp). February 12th.

3,654. Electrolytic Apparatus. I. H. Levin. February 12th. (May 9th, 1913.)

3,706. Electrical Switches for Automobiles and other purposes. W. W. Dean. February 12th. (February 18th, 1913.)

3,808. Automatic Recording Instruments. A. A. Holloway (C. H. Wilson). February 15th.

3,925. Electric Power Transmission, Self-starter and Lighting System for Motor Vehicles and the like. E. F. Roydhouse & A. H. Cheesman. February 16th.

4,432. Electric Heating Apparatus. H. Hirst & C. H. Archer. February 20th.

4,525. Jointing Devices for Tubes Carrying Electrical Conductors. H. H. Longbottom & T. Farrar. February 21st.

4,813. Lighting and other Auxiliary Circuits on Electrically-propelled Vehicles. British Thomson-Houston Co. (General Electric Co.). February 24th.

4,931. Protective Devices for Electric Distribution Systems. British Thomson-Houston Co. (General Electric Co.). February 25th.

5,131. Appliance for Preventing Unintentional Interruptions on Telephones. R. S. O. Dudfield. February 27th.

5,966. Device for the Electrical Control from a Distance of Guns or other mechanisms by means of a source of Continuous Current. E. Schneider. March 9th.

6,351. Control of Electric Winding-gear. British Thomson-Houston Co., & E. I. David. March 12th.

6,800. Sparking Plugs and their Terminal Covers. H. G. Longford, W. W. Longford & W. A. Clark. March 18th.

6,977. Overhead Trolley Wires and the like systems of Electric Traction. G. G. Glyn. March 19th.

7,440. Apparatus for Controlling Electric Lighting Systems by means of the Action of a Selenium or other Light Sensitive Cell. C. J. Turner. March 24th.

7,451. Automatic Regulation of Electric Arcs. E. Girardeau. March 24th. (April 1st, 1913.)

7,926. X-ray Generators. U. Magini. March 28th.

8,788. Exhibition or Advertising Device. W. D. Vick, A. E. Vick, & T. J. Farmer. April 7th.

9,504. Audible Electric Signal Repeaters for Indicating the Position of the Semaphore Signals on Railways. J. W. Clarke. April 17th. (Cognate application, 16,352/14.)

9,638. Telephone Receivers. E. C. R. Marks (Electrical Experiment Co.). April 18th.

9,794. Electric Heating Stove and Radiator. S. E. Foster, W. H. Arundale & C. H. Davies. April 21st.

10,100. Storage Batteries. B. Ford. April 23rd. (May 21st, 1913.)

11,829. Moving-picture Apparatus. S. G. S. Dicker (Ad-Display Machine Corporation). May 13th.

11,942. Electric Battery Lamps. W. J. Mellersh-Jackson (Interstate Electric Novelty Co.). May 14th.

12,907. Fire-extinguishing, Alarm and Indicating Apparatus for use on board ships and large buildings. F. W. Smith. May 26th.

15,052. Electric Headlights and the like. L. Renault. June 23rd. (July 1st, 1913.)

17,528. Tubular Insulators for High-tension Electricity. E. Haefely. July 24th.

17,567. Mechanism for Controlling Movement at a Distance Electrically. Harle et Cie. July 24th. (July 28th, 1913.)

17,885. Electrically-controlled Variable-speed Mechanism. C. T. Henderson. July 28th. (July 29th, 1913.)

18,304. Means of Selectively Controlling or Actuating Monogrammic or other Groups of Luminous or Non-luminous Elements applicable to Signalling or Advertising Devices. J. P. Naylor & Naylorgraph, Ltd. January 5th. (Divided application on 298/14, January 5th.)

18,418. Thermal Electric Switches. L. J. Schrubb. August 7th.

20,695. Electric Fuse or Cut-out Boxes having Multiple Ways. C. F. Parkinson, A. H. Railing, and C. C. Garrard. October 8th.

20,999. Interchangeable Electrode Holders for Arc Lamps. L. Hughes. October 15th.

21,590. Magneto-electric Machines for Ignition Purposes. F. H. Teagle. October 27th. (Divided application on 25,855/13, November 11th.)

22,176. Mounting of Electric Indicating Instruments in Switchboards, more particularly used on Motor-cars and other vehicles. C. A. Vandervell. November 7th.

South Africa.—Municipal Power Schemes.—On the recommendation of the Electrical Trade Section of the Johannesburg Chamber of Commerce, a communication has been addressed to the Administrator, Cape Province, calling attention to the fact that in recent cases of inquiries for tenders for power schemes connected with municipalities in the Cape Province, it has been found that the conditions imposed on contractors were so onerous that firms were unable to submit tenders. The principal reason was that the consulting engineer reserved to himself such excessive powers, that if firms had tendered they would have been compelled to provide a considerable sum for possible contingencies. The Committee submitted that it was most desirable that the conditions attaching to these schemes should be such as firms could comply with—for, in the cases in question, even had the firms concerned tendered, their prices would of necessity have been higher than would be the case if reasonable conditions were laid down. It was evident that in the circumstances (and particularly by reason of the absence of due competition) public interests suffered. The Administrator was, therefore, asked to authorise the Government electrical engineer to confer with a deputation from the Chamber of Commerce in order to discuss the difficulties which had arisen.
—*S.A. Mining Journal.*

Municipal Employés' Sick Pay.—At Accrington Town Council, last week, Ald. Higham explained, in answer to a question, that a young man employed on the switchboard at the electricity works was taken ill in July last. It had been the custom in some departments to pay men full wages for a short period and partial wages for another short period. Month by month this salary had been paid, and the young man in question had been receiving, in addition to his wages, his insurance money also. As near as he could tell, he had received £11 in excess of what he had been entitled to. From January to the end of last week the young man had worked off the surplus money, and had now secured another position.